# \*\*\*CASE\*\*\*

# Colonization Advantage

## 1AC – Colonization Advantage

### It’s Try or Die for human survival-

### A. Super volcanoes due to erupt-chain reaction leads to extinction

Mancuso 05 [Roberta, 4/1/05, Super volcanoes a ticking time bomb, says scientists, Domestic News, LexisNexis Academic]

Massive volcanoes with the potential to kill millions and trigger catastrophic effects for life on earth are well overdue for an eruption, a scientist says. Monash University Professor Ray Cas warned today it was only a matter of time before "super volcanoes", which he said were the greatest threat to the planet, could cause disasters on a magnitude greater than anything modern humankind had ever encountered. "A super volcano will definitely erupt," Prof Cas said. "It could be in a few, 50 or another 1000 years but sooner or later one is going to go off." Prof Cas, of the university's School of Geosciences, said super volcanoes were the largest on Earth and could be found in Italy, New Zealand, Indonesia, South America and the United States. The largest was Indonesia's Lake Toba, which had a crater diameter of 90km. Prof Cas said the 2,000-year eruption cycle of many of these volcanoes had passed and vulcanologists around the globe were simply watching and waiting for an imminent disaster. "Naples alone supports a population of three million people so the potential for destruction and death is huge," he said. "These super-volcanoes are potentially the greatest hazard on earth, the only threat greater being an asteroid impact from space." Prof Cas said the last significant eruption from a super volcano, known scientifically as a caldera, occurred 2000 years ago in New Zealand. He said eruptions could be so powerful that huge amounts of rock and ash could be flung into the atmosphere and there was a risk of tsunamis from volcanic flows hitting the ocean. "The potential death toll could reach the hundreds of thousands to millions and there are serious implications on climate, weather and viability of food production," Prof Cas said. Despite the imminent threat, governments were unprepared, he said. "The big problem is a lot of the volcanoes that potentially could erupt are perhaps not monitored to the degree that they should be, and of course we learnt that lesson from the Boxing Day tsunami disaster," Prof Cas said.

### B. Extinction is inevitable- nuke war, bioweapons, overpopulation, warming

Leslie 99 [John, Lifeboat Foundation Scientific Advisory Board member, “Risking Human Extinction”, http://lifeboat.com/ex/risking.human.extinction]

What chance has the human race of surviving the coming century, and perhaps further centuries? Comets and asteroids are very unlikely to exterminate us. During the next hundred years Earth may well be hit by something large enough to wipe out a city, or several cities if the thing hits an ocean, producing huge tidal waves. Yet even something much bigger, like the monster which exterminated the dinosaurs, probably would not be enough to kill all humans, and objects of that size arrive only about once in a hundred million years. Long before the next one did, humans should have spread far beyond their tiny planet so long as they had not exterminated themselves. How likely are they to do that? Let us look at various risks. First, there is nuclear warfare. There are still thousands of hydrogen bombs despite the collapse of the Soviet Union. Because of the chaos of its collapse, the threat of accidental nuclear war could well be greater than ever. Nitrogen oxides from a nuclear war might be disastrous to the ozone layer, Earth's shield against ultraviolet light. Also, nobody can be sure whether a "nuclear winter", severe cooling which lasted for months, would result from all the soot which burning cities and forests threw into the atmosphere. The radioactive fall out would work mischief too. Humans might be wiped out through the deaths of microorganisms which were crucial to the health of the biosphere. Biological warfare could be still more dangerous. Scientists could produce new diseases that spread more easily and killed far more efficiently than the Spanish 'flu which, appearing in 1918, ended more lives than the World War had just done. An aggressor nation's vaccines to protect itself could fail, in which case maybe everybody could be killed off. Do not say that nobody would be criminal enough to risk it! The world contains some very unpleasant individuals and, now that mammalian cells can be grown on tiny beads, a single bottle can produce viruses in numbers which previously required large factories. It is often population pressures which lead to warfare, and the world's population is still exploding. We have some six billion humans now, which means only very little usable land for each. There could be up to twelve billion humans by the end of the next century. Even without warfare, the environment could come under disastrous pressure. Many think it already is, thanks to such things as the unholy alliance between fertilizers and pesticides, the loss of forests, and the chlorofluorocarbons which continue to erode the ozone layer. Recent research suggests that in the northern hemisphere, during the crucial spring growing season, ozone losses will be double what had been estimated, because of how global greenhouse warming is linked to stratospheric cooling. And the warming might be disastrous just by itself. To get the consensus needed in 1992 for persuading the politicians in Rio, the International Panel on Climate Change disregarded worst case predictions, also dealing with biological feedback loops in just one sentence: "Biological feedbacks have not yet been taken into account."

### Life on Earth is unsustainable- global warming already doomed the planet

The Australian 10 [Cheryl Jones, 6/16/10, “Frank Fenner sees no home for humans”, http://www.theaustralian.com.au/higher-education/frank-fenner-sees-no-hope-for-humans/story-e6frgcjx-1225880091722]

FRANK Fenner doesn't engage in the skirmishes of the climate wars. To him, the evidence of global warming is in. Our fate is sealed. "We're going to become extinct," the eminent scientist says. "Whatever we do now is too late." Fenner is an authority on extinction. The emeritus professor in microbiology at the Australian National University played a leading role in sending one species into oblivion: the variola virus that causes smallpox. And his work on the myxoma virus suppressed wild rabbit populations on farming land in southeastern Australia in the early 1950s. He made the comments in an interview at his home in a leafy Canberra suburb. Now 95, he rarely gives interviews. But until recently he went into work each day at the ANU's John Curtin School of Medical Research, of which he was director from 1967 to 1973. Decades after his official retirement from the Centre for Resource and Environmental Studies, which he set up in 1973, he continued a routine established when he was running world-class facilities while conducting research. He'd get to work at 6.30am to spend a couple of hours writing textbooks before the rest of the staff arrived. Fenner, a fellow of the Australian Academy of Science and of the Royal Society, has received many awards and honours. He has published hundreds of scientific papers and written or co-written 22 books. He retrieves some of the books from his library. One of them, on smallpox, has physical as well as intellectual gravitas: it weighs 3.5kg. Another, on myxomatosis, was reprinted by Cambridge University Press last year, 44 years after the first edition came out. Fenner is chuffed, but disappointed that he could not update it with research confirming wild rabbits have developed resistance to the biological control agent. The study showed that myxo now had a much lower kill rate in the wild than in laboratory rabbits that had never been exposed to the virus. "The [wild] rabbits themselves had mutated," Fenner says. "It was an evolutionary change in the rabbits." His deep understanding of evolution has never diminished his fascination with observing it in the field. That understanding was shaped by studies of every scale, from the molecular level to the ecosystem and planetary levels. Fenner originally wanted to become a geologist but, on the advice of his father, studied medicine instead, graduating from the University of Adelaide in 1938. He spent his spare time studying skulls with prehistorian Norman Tindale. Soon after graduating, he joined the Royal Australian Army Medical Corps, serving in Egypt and Papua New Guinea. He is credited in part with Australia's victory in New Guinea because of his work to control malaria among the troops. "That quite changed my interest from looking at skulls to microbiology and virology," he says. But his later research in virology, focusing on pox viruses, took him also into epidemiology and population dynamics, and he would soon zoom out to view species, including our own, in their ecological context. His biological perspective is also geological. He wrote his first papers on the environment in the early 1970s, when human impact was emerging as a big problem. He says the Earth has entered the Anthropocene. Although it is not an official epoch on the geological timescale, the Anthropocene is entering scientific terminology. It spans the time since industrialisation, when our species started to rival ice ages and comet impacts in driving the climate on a planetary scale. Fenner says the real trouble is the population explosion and "unbridled consumption". The number of Homo sapiens is projected to exceed 6.9 billion this year, according to the UN. With delays in firm action on cutting greenhouse gas emissions, Fenner is pessimistic. "We'll undergo the same fate as the people on Easter Island," he says. "Climate change is just at the very beginning. But we're seeing remarkable changes in the weather already. "The Aborigines showed that without science and the production of carbon dioxide and global warming, they could survive for 40,000 or 50,000 years. But the world can't. The human species is likely to go the same way as many of the species that we've seen disappear. "Homo sapiens will become extinct, perhaps within 100 years," he says. "A lot of other animals will, too. It's an irreversible situation. I think it's too late. I try not to express that because people are trying to do something, but they keep putting it off

### Its time to get off the Rock: Scientists agree

Fox News 10 , (“Abandon Earth or Face Extinction, Stephen Hawking Warns – Again”, http://www.foxnews.com/scitech/2010/08/09/abandon-earth-face-extinction-warns-stephen-hawking/, 6/9/10)

It's time to abandon Earth, warned the world's most famous theoretical physicist. In an interview with website Big Think, Stephen Hawking warned that the long-term future of the planet is in outer space. "It will be difficult enough to avoid disaster on planet Earth in the next hundred years, let alone the next thousand, or million. The human race shouldn't have all its eggs in one basket, or on one planet," he said. "I see great dangers for the human race," Hawking said. "There have been a number of times in the past when its survival has been a question of touch and go. The Cuban missile crisis in 1963 was one of these. The frequency of such occasions is likely to increase in the future." "But I'm an optimist. If we can avoid disaster for the next two centuries, our species should be safe, as we spread into space," he said. That said, getting to another planet will prove a challenge, not to mention colonizing it for humanity. University of Michigan astrophysicist Katherine Freese told Big Think that "the nearest star [to Earth] is Proxima Centauri which is 4.2 light years away. That means that, if you were traveling at the speed of light the whole time, it would take 4.2 years to get there" -- or about 50,000 years using current rocket science. Still, we need to act and act fast, Hawking stated. "It will be difficult enough to avoid disaster in the next hundred years, let alone the next thousand or million. Our only chance of long-term survival is not to remain inward looking on planet Earth but to spread out into space. We have made remarkable progress in the last hundred years. But if we want to continue beyond the next hundred years, our future is in space." This is not the first time Hawking has warned of impending planetary doom. In 2006, the physicist warned that Earth was at an ever increasing risk of being wiped out. And lately, Hawking has become quite outspoken. In April, he warned of the dangers of communicating with aliens, telling the Discovery Channel that extra-terrestrials are almost certain to exist -- and humanity should avoid contact with them at all cost.“To my mathematical brain, the numbers alone make thinking about aliens perfectly rational,” he said. “The real challenge is to work out what aliens might actually be like.” The answer, he suggests, is that most of alien life will be the equivalent of microbes or simple animals -- the sort of life that has dominated Earth for most of its history -- and they could pose a serious threat to us. In May Hawking said he believed humans could travel millions of years into the future and repopulate their devastated planet. If spaceships are built that can fly faster than the speed of light, a day on board would be equivalent to a year on Earth. That's because -- according to Einstein -- as objects accelerate through space, time slows down around them. “Time travel was once considered scientific heresy, and I used to avoid talking about it for fear of being labelled a crank," he said in Stephen Hawking's Universe. "These days I’m not so cautious.”

### It’s now or never-

### A. Experts predict extinction in 100 years

The Economist 11[“Onward, Specks”, 5/9/11, http://www.economist.com/blogs/democracyinamerica/2011/05/futurology]

This newfound appreciation for the depths of time has led a handful of thinkers like [Sir Martin Rees, the Astronomer Royal], a theoretical cosmologist by training, to begin venturing some of humanity’s first real educated guesses about what may lie far, far, far ahead. Serious futurologists are not a large group yet. “It’s a fairly new area of inquiry,” says Nick Bostrom, an Oxford University philosophy professor who heads the school’s Future of Humanity Institute. But they are trying to give a first draft of a map of the future, using the kinds of rigor that theologians and uneducated guessers from previous generations didn’t have at their disposal. Broadly speaking, the futurologists are concerned with two questions—what's going to happen to the earth, and what's going to happen to the people living on it? Those are really different questions, and the first, at least, has a relatively straightforward answer. The earth is going to be just fine for millions and billions of years. Cosmologists get into the details, but the basic line is that it's going to be out in space, unthinkingly orbiting the sun, until the sun runs out and it does something else. So when we talk about "saving the planet" we really mean "save ourselves, please". That brings us to the second question. It also has a somewhat straightforward answer. As George W Bush put it, in the long run we'll all be dead. But how long is the long run? In 2003, Mr Rees gave it a 50/50 chance that humans will go extinct in the next hundred years; Mr Bostrom puts the odds of that at about 25%.

### B. NASA funding will end if the spaceflight program ends

Gott 09 [J. Richard Gott, Professor of Astrophysics at Princeton University, July 17, 2009, “A GOAL FOR THE HUMAN SPACEFLIGHT PROGRAM,” online: http://www.nasa.gov/pdf/368985main\_GottSpaceflightGoal.pdf]

The real space race is whether we colonize off the planet before the funds for the human spaceflight program end. Now that the Cold War is over, the driving force that got us to the Moon has ended and the human spaceflight program is in danger of extinction. Expensive technological projects are often abandoned after awhile. The Egyptians built bigger and bigger pyramids for about 50 years and then built smaller and less well made ones before finally quitting entirely. Admiral Cheng Ho sailed a great Chinese fleet all the way to Africa and brought back giraffes to the Chinese court. But then the Chinese government decided to cancel the program. Once lost, opportunities may not come again. The human spaceflight program is only 48 years old. The Copernican Principle tells us that our location is not likely to be special. If our location within the history of human space travel is not special, there is a 50% chance that we are in the last half now and that its future duration is less than 48 years (cf. Gott, 2007). If the human spaceflight program has a much longer future duration than this, then we would be lucky to be living in the first tiny bit of it. Bayesian statistics warn us against accepting hypotheses that imply our observations are lucky. It would be prudent to take the above Copernican estimate seriously since it assumes that we are not particularly lucky or unlucky in our location in time, and a wise policy should aim to protect us even against some bad luck. With such a short past track record of funding, it would be a mistake to count on much longer and better funding in the future. Instead, assuming funding levels in the next 48 years like those we have had in the past 48 years, we should ask ourselves what project we could undertake in the next 48 years that would be of most benefit to our species.

### Space colonization is the ONLY way to save the human race from extinction

Fox News 10 [Fox News, “Abandon Earth or Face Extinction, Stephen Hawking Warns – Again”, http://www.foxnews.com/scitech/2010/08/09/abandon-earth-face-extinction-warns-stephen-hawking/, 6/9/10]

It's time to abandon Earth, warned the world's most famous theoretical physicist. In an interview with website Big Think, Stephen Hawking warned that the long-term future of the planet is in outer space. "It will be difficult enough to avoid disaster on planet Earth in the next hundred years, let alone the next thousand, or million. The human race shouldn't have all its eggs in one basket, or on one planet," he said. "I see great dangers for the human race," Hawking said. "There have been a number of times in the past when its survival has been a question of touch and go. The Cuban missile crisis in 1963 was one of these. The frequency of such occasions is likely to increase in the future." "But I'm an optimist. If we can avoid disaster for the next two centuries, our species should be safe, as we spread into space," he said. That said, getting to another planet will prove a challenge, not to mention colonizing it for humanity. University of Michigan astrophysicist Katherine Freese told Big Think that "the nearest star [to Earth] is Proxima Centauri which is 4.2 light years away. That means that, if you were traveling at the speed of light the whole time, it would take 4.2 years to get there" -- or about 50,000 years using current rocket science. Still, we need to act and act fast, Hawking stated. "It will be difficult enough to avoid disaster in the next hundred years, let alone the next thousand or million. Our only chance of long-term survival is not to remain inward looking on planet Earth but to spread out into space. We have made remarkable progress in the last hundred years. But if we want to continue beyond the next hundred years, our future is in space." This is not the first time Hawking has warned of impending planetary doom. In 2006, the physicist warned that Earth was at an ever increasing risk of being wiped out. And lately, Hawking has become quite outspoken. In April, he warned of the dangers of communicating with aliens, telling the Discovery Channel that extra-terrestrials are almost certain to exist -- and humanity should avoid contact with them at all cost. “To my mathematical brain, the numbers alone make thinking about aliens perfectly rational,” he said. “The real challenge is to work out what aliens might actually be like.” The answer, he suggests, is that most of alien life will be the equivalent of microbes or simple animals -- the sort of life that has dominated Earth for most of its history -- and they could pose a serious threat to us. In May Hawking said he believed humans could travel millions of years into the future and repopulate their devastated planet. If spaceships are built that can fly faster than the speed of light, a day on board would be equivalent to a year on Earth. That's because -- according to Einstein -- as objects accelerate through space, time slows down around them. “Time travel was once considered scientific heresy, and I used to avoid talking about it for fear of being labelled a crank," he said in Stephen Hawking's Universe. "These days I’m not so cautious.”

### Space colonization solves extinction- Bioterrorism is the most likely scenario

Matheny, 7 [Jason G. Matheny, “Reducing the Risk of Human Extinction,” December 7, 2007, Risk Analysis: Volume 27, Issue 5, pages 1335–1344, <http://onlinelibrary.wiley.com/doi/10.1111/j.1539-6924.2007.00960.x/full>, DA 7/16/11]//RS

As for astronomical risks, to escape our sun's death, humanity will eventually need to relocate. If we survive the next century, we are likely to build self-sufficient colonies in space. We would be motivated by self-interest to do so, as asteroids, moons, and planets have valuable resources to mine, and the technological requirements for colonization are not beyond imagination (Kargel, 1994; Lewis, 1996). Colonizing space sooner, rather than later, could reduce extinction risk (Gott, 1999; Hartmann, 1984; Leslie, 1999), as a species' survivability is closely related to the extent of its range (Hecht, 2006). Citing, in particular, the threat of new biological weapons, Stephen Hawking has said, “I don't think the human race will survive the next thousand years, unless we spread into space. There are too many accidents that can befall life on a single planet” (Highfield, 2001). Similarly, NASA Administrator, Michael Griffin (2006), recently remarked: “The history of life on Earth is the history of extinction events, and human expansion into the Solar System is, in the end, fundamentally about the survival of the species.” Perhaps more cost effective than building refuges in space would be building them on Earth. Elaborate bunkers exist for government leaders to occupy during a nuclear war (McCamley, 2007). And remote facilities are planned to protect crop seeds from “nuclear war, asteroid strikes, and climate change” (Hopkin, 2007). But I know of no self-sufficient, remote, permanently occupied refuge meant to protect humanity from a range of possible extinction events. Hanson (2007) argues that a refuge permanently housing as few as 100 people would significantly improve the chances of human survival during a range of global catastrophes. The Americas and Polynesia were originally populated by fewer than 100 founders (Hey, 2005; Murray-McIntosh et al., 1998). Although it would take thousands of years for 100 people to repopulate Earth, this would be a small setback compared to extinction.

## Solvency- Don’t wait

### Need to get off the rock now: waiting kills

Bostrom 04 (Nick, philosophy professor at Yale & Oxford,” Astronomical Waste: The Opportunity Cost of Delayed Technological Developmenthttp://www.nickbostrom.com/astronomical/waste.htm)

As I write these words, suns are illuminating and heating empty rooms, unused energy is being flushed down black holes, and our great common endowment of negentropy is being irreversibly degraded into entropy on a cosmic scale. These are resources that an advanced civilization could have used to create value-structures, such as sentient beings living worthwhile lives. The rate of this loss boggles the mind. One recent paper speculates, using loose theoretical considerations based on the rate of increase of entropy, that the loss of potential human lives in our own galactic supercluster is at least ~10^46 per century of delayed colonization.[1] This estimate assumes that all the lost entropy could have been used for productive purposes, although no currently known technological mechanisms are even remotely capable of doing that. Since the estimate is meant to be a lower bound, this radically unconservative assumption is undesirable. We can, however, get a lower bound more straightforwardly by simply counting the number or stars in our galactic supercluster and multiplying this number with the amount of computing power that the resources of each star could be used to generate using technologies for whose feasibility a strong case has already been made. We can then divide this total with the estimated amount of computing power needed to simulate one human life. As a rough approximation, let us say the Virgo Supercluster contains 10^13 stars. One estimate of the computing power extractable from a star and with an associated planet-sized computational structure, using advanced molecular nanotechnology[2], is 10^42 operations per second.[3] A typical estimate of the human brain’s processing power is roughly 10^17 operations per second or less.[4] Not much more seems to be needed to simulate the relevant parts of the environment in sufficient detail to enable the simulated minds to have experiences indistinguishable from typical current human experiences.[5] Given these estimates, it follows that the potential for approximately 10^38 human lives is lost every century that colonization of our local supercluster is delayed; or equivalently, about 10^31 potential human lives per second. While this estimate is conservative in that it assumes only computational mechanisms whose implementation has been at least outlined in the literature, it is useful to have an even more conservative estimate that does not assume a non-biological instantiation of the potential persons. Suppose that about 10^10 biological humans could be sustained around an average star. Then the Virgo Supercluster could contain 10^23 biological humans. This corresponds to a loss of potential equal to about 10^14 potential human lives per second of delayed colonization. What matters for present purposes is not the exact numbers but the fact that they are huge. Even with the most conservative estimate, assuming a biological implementation of all persons, the potential for one hundred trillion potential human beings is lost for every second of postponement of colonization of our supercluster.[6] From a utilitarian perspective, this huge loss of potential human lives constitutes a correspondingly huge loss of potential value. I am assuming here that the human lives that could have been created would have been worthwhile ones. Since it is commonly supposed that even current human lives are typically worthwhile, this is a weak assumption. Any civilization advanced enough to colonize the local supercluster would likely also have the ability to establish at least the minimally favorable conditions required for future lives to be worth living. The effect on total value, then, seems greater for actions that accelerate technological development than for practically any other possible action. Advancing technology (or its enabling factors, such as economic productivity) even by such a tiny amount that it leads to colonization of the local supercluster just one second earlier than would otherwise have happened amounts to bringing about more than 10^31 human lives (or 10^14 human lives if we use the most conservative lower bound) that would not otherwise have existed. Few other philanthropic causes could hope to mach that level of utilitarian payoff. Utilitarians are not the only ones who should strongly oppose astronomical waste. There are many views about what has value that would concur with the assessment that the current rate of wastage constitutes an enormous loss of potential value. For example, we can take a thicker conception of human welfare than commonly supposed by utilitarians (whether of a hedonistic, experientialist, or desire-satisfactionist bent), such as a conception that locates value also in human flourishing, meaningful relationships, noble character, individual expression, aesthetic appreciation, and so forth. So long as the evaluation function is aggregative (does not count one person’s welfare for less just because there are many other persons in existence who also enjoy happy lives) and is not relativized to a particular point in time (no time-discounting), the conclusion will hold. These conditions can be relaxed further. Even if the welfare function is not perfectly aggregative (perhaps because one component of the good is diversity, the marginal rate of production of which might decline with increasing population size), it can still yield a similar bottom line provided only that at least some significant component of the good is sufficiently aggregative. Similarly, some degree of time-discounting future goods could be accommodated without changing the conclusion.[7] In light of the above discussion, it may seem as if a utilitarian ought to focus her efforts on accelerating technological development. The payoff from even a very slight success in this endeavor is so enormous that it dwarfs that of almost any other activity. We appear to have a utilitarian argument for the greatest possible urgency of technological development. However, the true lesson is a different one. If what we are concerned with is (something like) maximizing the expected number of worthwhile lives that we will create, then in addition to the opportunity cost of delayed colonization, we have to take into account the risk of failure to colonize at all. We might fall victim to an existential risk, one where an adverse outcome would either annihilate Earth-originating intelligent life or permanently and drastically curtail its potential.[8] Because the lifespan of galaxies is measured in billions of years, whereas the time-scale of any delays that we could realistically affect would rather be measured in years or decades, the consideration of risk trumps the consideration of opportunity cost. For example, a single percentage point of reduction of existential risks would be worth (from a utilitarian expected utility point-of-view) a delay of over 10 million years. Therefore, if our actions have even the slightest effect on the probability of eventual colonization, this will outweigh their effect on when colonization takes place. For standard utilitarians, priority number one, two, three and four should consequently be to reduce existential risk. The utilitarian imperative “Maximize expected aggregate utility!” can be simplified to the maxim “Minimize existential risk!”. The argument above presupposes that our concern is to maximize the total amount of well-being. Suppose instead that we adopt a “person-affecting” version of utilitarianism, according to which our obligations are primarily towards currently existing persons and to those persons that will come to exist.[9] On such a person-affecting view, human extinction would be bad only because it makes past or ongoing lives worse, not because it constitutes a loss of potential worthwhile lives. What ought someone who embraces this doctrine do? Should he emphasize speed or safety, or something else? To answer this, we need to consider some further matters. Suppose one thinks that the probability is negligible that any existing person will survive long enough to get to use a significant portion of the accessible astronomical resources, which, as described in opening section of this paper, are gradually going to waste. Then one’s reason for minimizing existential risk is that sudden extinction would off cut an average of, say, 40 years from each of the current (six billion or so) human lives.[10] While this would certainly be a large disaster, it is in the same big ballpark as other ongoing human tragedies, such as world poverty, hunger and disease. On this assumption, then, a person-affecting utilitarian should regard reducing existential risk as a very important but not completely dominating concern. There would in this case be no easy answer to what he ought to do. Where he ought to focus his efforts would depend on detailed calculations about which area of philanthropic activity he would happen to be best placed to make a contribution to. Arguably, however, we ought to assign a non-negligible probability to some current people surviving long enough to reap the benefits of a cosmic diaspora. A so-called technological “singularity” might occur in our natural lifetime[11], or there could be a breakthrough in life-extension, brought about, perhaps, as result of machine-phase nanotechnology that would give us unprecedented control over the biochemical processes in our bodies and enable us to halt and reverse the aging process.[12] Many leading technologists and futurist thinkers give a fairly high probability to these developments happening within the next several decades.[13] Even if you are skeptical about their prognostications, you should consider the poor track record of technological forecasting. In view of the well-established unreliability of many such forecasts, it would seem unwarranted to be so confident in one’s prediction that the requisite breakthroughs will not occur in our time as to give the hypothesis that they will a probability of less than, say, 1%. The expected utility of a 1% chance of realizing an astronomically large good could still be astronomical. But just how good would it be for (some substantial subset of) currently living people to get access to astronomical amounts of resources? The answer is not obvious. On the one hand, one might reflect that in today’s world, the marginal utility for an individual of material resources declines quite rapidly once his basic needs have been met. Bill Gates' level of well-being does not seem to dramatically exceed that of many a person of much more modest means. On the other hand, advanced technologies of the sorts that would most likely be deployed by the time we could colonize the local supercluster may well provide new ways of converting resources into well-being. In particular, material resources could be used to greatly expand our mental capacities and to indefinitely prolong our subjective lifespan. And it is by no means clear that the marginal utility of extended healthspan and increased mental powers must be sharply declining above some level. If there is no such decline in marginal utility, we have to conclude that the expected utility to current individuals of successful colonization of our supercluster is astronomically great, and this conclusion holds even if one gives a fairly low probability to that outcome. A long shot it may be, but for an expected utility maximizer, the benefit of living for perhaps billions of subjective years with greatly expanded capacities under fantastically favorable conditions could more than make up for the remote prospects of success. Now, if these assumptions are made, what follows about how a person-affecting utilitarian should act? Clearly, avoiding existential calamities is important, not just because it would truncate the natural lifespan of six billion or so people, but also – and given the assumptions this is an even weightier consideration – because it would extinguish the chance that current people have of reaping the enormous benefits of eventual colonization. However, by contrast to the total utilitarian, the person-affecting utilitarian would have to balance this goal with another equally important desideratum, namely that of maximizing the chances of current people surviving to benefit from the colonization. For the person-affecting utilitarian, it is not enough that humankind survives to colonize; it is crucial that extant people be saved. This should lead her to emphasize speed of technological development, since the rapid arrival advanced technology would surely be needed to help current people stay alive until the fruits of colonization could be harvested. If the goal of speed conflicts with the goal of global safety, the total utilitarian should always opt to maximize safety, but the person-affecting utilitarian would have to balance the risk of people dying of old age with the risk of them succumbing in a species-destroying catastrophe.[14]

## Now or Never

### NASA funding will deplete after the end of the current space program

Gott 09 [J. Richard Gott, Professor of Astrophysics at Princeton University, July 17, 2009, “A GOAL FOR THE HUMAN SPACEFLIGHT PROGRAM,” online: http://www.nasa.gov/pdf/368985main\_GottSpaceflightGoal.pdf]

The real space race is whether we colonize off the planet before the funds for the human spaceflight program end. Now that the Cold War is over, the driving force that got us to the Moon has ended and the human spaceflight program is in danger of extinction. Expensive technological projects are often abandoned after awhile. The Egyptians built bigger and bigger pyramids for about 50 years and then built smaller and less well made ones before finally quitting entirely. Admiral Cheng Ho sailed a great Chinese fleet all the way to Africa and brought back giraffes to the Chinese court. But then the Chinese government decided to cancel the program. Once lost, opportunities may not come again. The human spaceflight program is only 48 years old. The Copernican Principle tells us that our location is not likely to be special. If our location within the history of human space travel is not special, there is a 50% chance that we are in the last half now and that its future duration is less than 48 years (cf. Gott, 2007). If the human spaceflight program has a much longer future duration than this, then we would be lucky to be living in the first tiny bit of it. Bayesian statistics warn us against accepting hypotheses that imply our observations are lucky. It would be prudent to take the above Copernican estimate seriously since it assumes that we are not particularly lucky or unlucky in our location in time, and a wise policy should aim to protect us even against some bad luck. With such a short past track record of funding, it would be a mistake to count on much longer and better funding in the future. Instead, assuming funding levels in the next 48 years like those we have had in the past 48 years, we should ask ourselves what project we could undertake in the next 48 years that would be of most benefit to our species.

## Super volcanoes

### Super volcanoes due to erupt-chain reaction leads to extinction

Mancuso 05 [Roberta, 4/1/05, Super volcanoes a ticking time bomb, says scientists, Domestic News, LexisNexis Academic]

Massive volcanoes with the potential to kill millions and trigger catastrophic effects for life on earth are well overdue for an eruption, a scientist says. Monash University Professor Ray Cas warned today it was only a matter of time before "super volcanoes", which he said were the greatest threat to the planet, could cause disasters on a magnitude greater than anything modern humankind had ever encountered. "A super volcano will definitely erupt," Prof Cas said. "It could be in a few, 50 or another 1000 years but sooner or later one is going to go off." Prof Cas, of the university's School of Geosciences, said super volcanoes were the largest on Earth and could be found in Italy, New Zealand, Indonesia, South America and the United States. The largest was Indonesia's Lake Toba, which had a crater diameter of 90km. Prof Cas said the 2,000-year eruption cycle of many of these volcanoes had passed and vulcanologists around the globe were simply watching and waiting for an imminent disaster. "Naples alone supports a population of three million people so the potential for destruction and death is huge," he said. "These super-volcanoes are potentially the greatest hazard on earth, the only threat greater being an asteroid impact from space." Prof Cas said the last significant eruption from a super volcano, known scientifically as a caldera, occurred 2000 years ago in New Zealand. He said eruptions could be so powerful that huge amounts of rock and ash could be flung into the atmosphere and there was a risk of tsunamis from volcanic flows hitting the ocean. "The potential death toll could reach the hundreds of thousands to millions and there are serious implications on climate, weather and viability of food production," Prof Cas said. Despite the imminent threat, governments were unprepared, he said. "The big problem is a lot of the volcanoes that potentially could erupt are perhaps not monitored to the degree that they should be, and of course we learnt that lesson from the Boxing Day tsunami disaster," Prof Cas said.

### Super volcano eruption causes mega-tsunamis and another iceage

The Guardian 05 [Bill McGuire, 3/10/05, “Life: This eruption could put a tsunami in the shade: Supervolcanos are so big they could start another ice age. Bill McGuire on a truly terrifying phenomenon”, LexisNexis Academic]

Have you noticed that everything is getting bigger these days. Televisions, cars, burgers - even the people who eat them? The same seems to be happening with natural catastrophes. Not content with worrying about tsunamis - even though the standard variety has shown that it can erase a third of a million lives - we are now losing sleep over mega-tsunamis, waves tens of metres high capable of trashing the entire Atlantic coastline. Not satisfied with the run-of-the-mill volcanic eruption, we now look to the next super-eruption and wonder if we will still be around when the ash settles. Globally, catastrophic events are rare, with return periods of tens or hundreds of thousands of years, but they hold a great fascination for us. Take super-eruptions. These awesome volcanic blasts were merely scientific curiosities prior to 1999, when the BBC featured them on Horizon. Before transmission, few outside the volcanological community had any inkling that a single eruption could threaten the survival of our race. Now it is difficult to find anyone who is not aware of the menace. A Geological Society of London working group composed of senior earth scientists says the effects of a super-eruption would be comparable to those predicted for the impact of a 1km-diameter asteroid with the Earth, and that super-eruptions are five to 10 times more likely to occur than such an impact. As the BBC prepares to terrify us once again with Supervolcano, a dramatisation of the next great blast at Yellowstone, it seems a good time to ask what exactly a super-eruption is. Volcanic eruptions come in a huge variety of shapes and sizes, from harmless dribbles of lava to cataclysmic explosions that can destroy a town, or even a small country. Super-eruptions are distanced from standard eruptions by the amount of ash and debris they eject: a thousand cubic kilometres and more by volume, or upwards of a trillion tonnes by weight. The effects of a super-eruption can be devastating - the Toba eruption in Sumatra 74,000 years ago kicked out enough ash to bury the entire UK to a depth of four metres - and capture the imagination. Volcanologists Mike Rampino of New York University and Steve Self, now at the Open University, started the ball rolling in 1992 with publication in Nature of their paper on the Toba super-eruption. Citing the idea that the huge volumes of sulphur gases expelled by the volcano might have created a 5,000m tonne load of sulphuric acid aerosols in the stratosphere, forming a very effective sun- block, the authors envisaged a bitter "Toba Winter" following the eruption, with global temperatures plummeting by 3-5C. Not content with this, they went on to suggest that with temperatures already falling, the added cooling effect of the eruption might have been just sufficient to accelerate our world into the last ice age, from which it only really emerged 10,000 years ago. The Toba Winter seems real enough, and four years later Greg Zielinski, of the University of Maine, and co-workers announced clear evidence for an abrupt five- or six-year fall in temperatures close to the time of the Toba blast, determined from an examination of the volcanic eruption record preserved in cores extracted from deep within the Greenland ice sheet. But what of the effect of this episode of bitter cold on our ancestors? Was it just an inconvenience or something more? A number of scientists have plumped for the latter, including Mike Rampino and anthropologist Stanley Ambrose, of the University of Illinois. They, and others it must be said, like the idea that the Toba super-eruption was responsible for a human population bottleneck that seems to have occurred around this time. Human numbers may have fallen to only a few thousand, making our surviving ancestors an endangered species.

### Super volcanoes threaten to explode at any moment-Lake Taupo proves

Herald Sun 05 [Milanda Rout, 3/9/05, “Super volcano is real risk”, LexisNexis Academic]

A SUPER-VOLCANO could erupt any time and wipe out millions of people, scientists fear. Australia would be at risk of a tsunami, acid rain and a huge temperature drop if such a volcano erupted nearby. Volcano experts also warn that authorities and the community are not ready for such an event. Super-volcanoes are giant volcanoes that would be equivalent to the force of 1000 Hiroshima atom bombs exploding every second. A vast cloud of ash would form a veil around the earth, blocking out sunlight and causing temperatures to drop by 10C or more. Monash University volcanologist Professor Ray Cas said the threat of a super-volcano was real. "One of these big volcanoes is going to erupt in the future, and we need to be aware of this," he said. He said the super-volcanoes closest to Australia included Lake Taupo in New Zealand. Prof Cas said the last time Lake Taupo erupted was 2000 years ago. "And it is just about ready to go again," Prof Cas said. "We need increased research and hazard planning."

### Multiple super volcanoes are due to erupt- cause tsunamis and another iceage

Sydney Morning Herald 05 [Richard Macey, 4/1/05, “Sleeping giants may soon wake to dwarf all previous disasters; SUPER VOLCANOES INDONESIAN QUAKE ON SHAKY GROUND”, LexisNexis Academic]

Sumatra's disaster-weary people may have more than earthquakes and a tsunami to worry them. Hit by two natural disasters in three months, the island is also home to Lake Toba, a super volcano overdue to wake from its 73,000-year slumber, a scientist warned yesterday. Ray Cas, from Monash University's School of Geosciences, said Lake Toba's next blast could be big enough to disrupt the world's climate and send a tsunami surging towards Australia. Professor Cas said none of the world's 100 or so active super volcanoes had erupted in modern times. However, if one did, it would be 100 to 1000 times more powerful than Krakatoa's 1883 eruption. He feared the threat was being overlooked, just as the danger posed by Indian Ocean tsunami had been ignored. "The Boxing Day tsunami was going to happen sooner or later, but there were no warning systems. A super volcano will happen sooner or later, and there are limited warning systems," he said. "We certainly need to be improving our monitoring of super volcanoes. If any of these were to erupt we would see disaster on a magnitude greater than we have ever experienced ... the only threat greater being an asteroid impact." When Lake Toba erupted 73,000 years ago the world's climate was balanced on the edge of an ice age, Professor Cas said. "The eruption released 1000 cubic kilometres of ash and rock debris into the atmosphere, much of it as fine ash which blocked out solar radiation, kicking the world back into an ice age." In addition to cooling the world, with devastating results for global agriculture, Lake Toba's next eruption would probably send a pyroclastic flow - a rush of superheated gas and ash - crashing into the sea with enough force to trigger a tsunami. The volcano was definitely still active, influenced by the same movement of tectonics plates that triggered the December 26 and March 28 earthquakes. Another super volcano overdue for eruption was Taupo, on New Zealand's North Island. "It has a big eruption every 2000 years and it last erupted about 2000 years ago". And, "the majority of Naples sits in the crater or caldera of Campei Flegrei - about 3 million people live within one of these super volcanoes."

### Super volcano is inevitable- contaminated soil and perpetual winter makes life unsustainable

Britt 05 [Robert Roy Britt, Livescience Senior Writer, “Super volcanoes will chill the world someday”, http://www.msnbc.msn.com/id/7129908/, 3/8/2005]

The eruption of a super volcano "sooner or later" will chill the planet and threaten human civilization, British scientists warned Tuesday. And now the bad news: There's not much anyone can do about it. Several volcanoes around the world are capable of gigantic eruptions unlike anything witnessed in recorded history, based on geologic evidence of past events, the scientists said. Such eruptions would dwarf those of Mount St. Helens, Krakatoa, Pinatubo and anything else going back dozens of millennia. "Super eruptions are up to hundreds of times larger than these," said Stephen Self of Britain's Open University. "An area the size of North America can be devastated, and pronounced deterioration of global climate would be expected for a few years following the eruption," Self said. "They could result in the devastation of world agriculture, severe disruption of food supplies, and mass starvation. These effects could be sufficiently severe to threaten the fabric of civilization." Self and his colleagues at the Geological Society of London presented their report to the British government's Natural Hazard Working Group. "Although very rare, these events are inevitable, and at some point in the future humans will be faced with dealing with and surviving a super eruption," Stephen Sparks of the University of Bristol told LiveScience in advance of Tuesday's announcement. Advertise | AdChoices Supporting evidence The warning is not new. Geologists in the United States detailed a similar scenario in 2001, when they found evidence suggesting volcanic activity in Yellowstone National Park will eventually lead to a colossal eruption. Half the United States will be covered in ash up to 3 feet (1 meter) deep, according to a study published in the journal Earth and Planetary Science Letters. Explosions of this magnitude "happen about every 600,000 years at Yellowstone," says Chuck Wicks of the U.S. Geological Survey, who has studied the possibilities in separate work. "And it's been about 620,000 years since the last super explosive eruption there." Interactive: Anatomy of a volcano Past volcanic catastrophes at Yellowstone and elsewhere remain evident as giant collapsed basins called calderas. A super eruption is a scaled up version of a typical volcanic outburst, Sparks explained. Each is caused by a rising and growing chamber of hot molten rock known as magma. "In super eruptions the magma chamber is huge," Sparks said. The eruption is rapid, occurring in a matter of days. "When the magma erupts the overlying rocks collapse into the chamber, which has reduced its pressure due to the eruption. The collapse forms the huge crater." The eruption pumps dust and chemicals into the atmosphere for years, screening the Sun and cooling the planet. Earth is plunged into a perpetual winter, some models predict, causing many plant and animal species to disappear forever. "The whole of a continent might be covered by ash, which might take many years — possibly decades — to erode away and for vegetation to recover," Sparks said. Yellowstone may be winding down geologically, experts say. But they believe it harbors at least one final punch. Globally, there are still plenty of possibilities for super volcano eruptions, even as Earth quiets down over the long haul of its 4.5-billion-year existence. "The earth is of course losing energy, but at a very slow rate, and the effects are only really noticeable over billions rather than millions of years," Sparks said. Human impact The odds of a globally destructive volcano explosion in any given century are extremely low, and no scientist can say when the next one will occur. But the chances are five to 10 times greater than a globally destructive asteroid impact, according to the new British report. The next super eruption, whenever it occurs, might not be the first one humans have dealt with. About 74,000 years ago, in what is now Sumatra, a volcano called Toba blew with a force estimated at 10,000 times that of Mount St. Helens. Ash darkened the sky all around the planet. Temperatures plummeted by up to 21 degrees at higher latitudes, according to research by Michael Rampino, a biologist and geologist at New York University. Advertise | AdChoices Rampino has estimated three-quarters of the plant species in the Northern Hemisphere perished. Stanley Ambrose, an anthropologist at the University of Illinois, suggested in 1998 that Rampino's work might explain a curious bottleneck in human evolution: The blueprints of life for all humans — DNA — are remarkably similar, given that our species branched off from the rest of the primate family tree a few million years ago. Ambrose has said early humans were perhaps pushed to the edge of extinction after the Toba eruption — around the same time folks got serious about art and tool making. Perhaps only a few thousand survived. Humans today would all be descended from these few, and in terms of the genetic code, not a whole lot would change in 74,000 years. Sitting ducks Based on the latest evidence, eruptions the size of the giant Yellowstone and Toba events occur at least every 100,000 years, Sparks said, "and it could be as high as every 50,000 years. There are smaller but nevertheless huge eruptions which would have continental to global consequences every 5,000 years or so." Unlike other threats to humanity — asteroids, nuclear attacks and global warming, to name a few — there's little to be done about a super volcano. "While it may in future be possible to deflect asteroids or somehow avoid their impact, even science fiction cannot produce a credible mechanism for averting a super eruption," the new report states. "No strategies can be envisaged for reducing the power of major volcanic eruptions." The Geological Society of London has issued similar warnings going back to 2000. The scientists this week called for more funding to investigate further the history of super eruptions and their likely effects on the planet and on modern society. "Sooner or later a super eruption will happen on Earth, and this issue also demands serious attention," the report concludes.

### Super volcano eruptions are inevitable-Yellowstone proves

Achenbach 09 [Joel Achenbach, Writer for National Geographic, “When Yellowstone Explodes”, http://ngm.nationalgeographic.com/2009/08/yellowstone/achenbach-text/1, August 2009]

There are volcanoes, and then there are supervolcanoes. The latter have no agreed-on definition—the term was popularized in a BBC documentary in 2000—but some scientists use it to describe explosions of exceptional violence and volume. The U.S. Geological Survey applies the term to any eruption ejecting more than 1,000 cubic kilometers (240 cubic miles) of pumice and ash in a single event—more than 50 times the size of the infamous Krakatau eruption of 1883, which killed more than 36,000 people. Volcanoes form mountains; supervolcanoes erase them. Volcanoes kill plants and animals for miles around; supervolcanoes threaten whole species with extinction by changing the climate across the entire planet. No supervolcano has erupted in recorded human history, but geologists have pieced together what an explosion must have been like. First, a plume of heat wells up from deep within the planet and melts rock just beneath the crust of the Earth, creating a vast chamber filled with a pressurized mix of magma, semisolid rock, and dissolved water vapor, carbon dioxide, and other gases. As additional magma accumulates in the chamber over thousands of years, the land above begins to dome upward by inches. Fractures open along the dome's edges, as if burglars were sawing a hole from beneath a wooden floor. When the pressure in the magma chamber is released through the fractures, the dissolved gases suddenly explode in a massive, runaway reaction. It's like "opening the Coke bottle after you've shaken it," says Bob Christiansen, a U.S. Geological Survey scientist who pioneered research on the Yellowstone volcano in the 1960s. With the magma chamber emptied, the surface collapses. The entire domed region simply falls into the planet, as though the Earth were consuming itself. Left behind is a giant caldera, from the Spanish word for "cauldron." The "hot spot" responsible for the Yellowstone caldera has erupted dozens of times in the past, going back some 18 million years. Since the hot spot is rooted deep in the Earth, and the tectonic plate above it is moving southwest, ghostly calderas from the more ancient explosions are strung out like a series of gigantic beads across southern Idaho and into Oregon and Nevada, the subsequent lava flows forming the eerie moonscapes of the Snake River Plain. The last three super-eruptions have been in Yellowstone itself. The most recent, 640,000 years ago, was a thousand times the size of the Mount St. Helens eruption in 1980, which killed 57 people in Washington. But numbers do not capture the full scope of the mayhem. Scientists calculate that the pillar of ash from the Yellowstone explosion rose some 100,000 feet, leaving a layer of debris across the West all the way to the Gulf of Mexico. Pyroclastic flows—dense, lethal fogs of ash, rocks, and gas, superheated to 1,470 degrees Fahrenheit—rolled across the landscape in towering gray clouds. The clouds filled entire valleys with hundreds of feet of material so hot and heavy that it welded itself like asphalt across the once verdant landscape. And this wasn't even Yellowstone's most violent moment. An eruption 2.1 million years ago was more than twice as strong, leaving a hole in the ground the size of Rhode Island. In between, 1.3 million years ago, was a smaller but still devastating eruption.

## Overpopulation/Warming

### **Overpopulation causes global warming- carbon dioxide due to gas emissions**

Mulkins 06 [Phil, 12/11, Overpopulatiuon a key factor in global carbon dioxide, Action Line News, LexisNexis Academic]

Overpopulation does contribute to greenhouse gas emission but not due to breathing -- it's the more people we have, the more cars we have, and the more energy we need to heat and cool homes and the more trees we cut down to build homes. It is overpopulation that is the root problem of all problems," said Hobson. "Overpopulation does contribute to the problem, but not because of all the extra breathing. If we only had half as many people, we would be emitting only half as much carbon. Everybody concerned with global warming is also concerned with overpopulation. They are eager to level it off somewhere below the 12 billion that it could become -- that's about twice what it is today -- and keep it under 8 billion. "Greenhouse gas emission is proportional to the number of people, but not because of breathing. It's because of technology -- vehicles (25 percent) and power plants (50 percent). But you could say that overpopulation is 100 percent responsible because if there were no people, there would be no global warming, and if there were half as many people, there would be half the global warming. "Another concept I agree with is 'the earth's carrying capacity has already been exceeded by the human race.' Its carrying capacity is probably a few billion and certainly not as much as 6 billion. Global warming is just a part of that capacity -- the rest of it is the ability of the planet to produce enough food, to provide enough area, to have enough water to produce food and for drinking and sanitation, to have enough other resources to sustain our high-tech society. This planet is just packed -- however you look at it."

### Global warming leads to extinction by the end of the century

Henzell 04 [John H. “Human extinction imminent”, The Press (Christchurch, New Zealand), 11/17/04, LexisNexis Academic]

A top New Zealand researcher is using a prestigious award ceremony in Christchurch to warn that humans face extinction by the end of the century. Professor Peter Barrett will be presented with the Marsden Medal tonight for his 40-year contribution to Antarctic research, latterly focusing on climate change. The director of Victoria University's Antarctic Research Centre expects to use his acceptance speech to warn climate change was a major threat to the planet. "After 40 years, I'm part of a huge community of scientists who have become alarmed with our discovery, that we know from our knowledge of the ancient past, that if we continue our present growth path, we are facing extinction," Barrett said. "Not in millions of years, or even millennia, but by the end of this century." Barrett won the award -- designed to mark lifetime achievement in the sciences -- for his research into Antarctica, which began with helping prove New Zealand was once part of the Gondwanaland supercontinent. He then changed disciplines, to predicting the impact of climate change. The result was a body of research on Antarctic ice sheets "which to our surprise is becoming increasingly relevant to the world as a consequence of global warming". Barrett's warning underlines comments he made last year that even the Kyoto Protocol on global warming would not be enough to avert a climate disaster. The United States and Australia have refused to adopt Kyoto protocol measures. "Research on the past Antarctic climate has an ominous warning for the future ..." he said. "We need an international commitment to an effective solution, if we are to survive the worst consequences of this grandest of all human experiments."

### Extinction is unavoidable- overpopulation and global warming

The Australian 10 [Cheryl Jones, 6/16/10, “Frank Fenner sees no home for humans”, http://www.theaustralian.com.au/higher-education/frank-fenner-sees-no-hope-for-humans/story-e6frgcjx-1225880091722]

FRANK Fenner doesn't engage in the skirmishes of the climate wars. To him, the evidence of global warming is in. Our fate is sealed. "We're going to become extinct," the eminent scientist says. "Whatever we do now is too late." Fenner is an authority on extinction. The emeritus professor in microbiology at the Australian National University played a leading role in sending one species into oblivion: the variola virus that causes smallpox. And his work on the myxoma virus suppressed wild rabbit populations on farming land in southeastern Australia in the early 1950s. He made the comments in an interview at his home in a leafy Canberra suburb. Now 95, he rarely gives interviews. But until recently he went into work each day at the ANU's John Curtin School of Medical Research, of which he was director from 1967 to 1973. Decades after his official retirement from the Centre for Resource and Environmental Studies, which he set up in 1973, he continued a routine established when he was running world-class facilities while conducting research. He'd get to work at 6.30am to spend a couple of hours writing textbooks before the rest of the staff arrived. Fenner, a fellow of the Australian Academy of Science and of the Royal Society, has received many awards and honours. He has published hundreds of scientific papers and written or co-written 22 books. He retrieves some of the books from his library. One of them, on smallpox, has physical as well as intellectual gravitas: it weighs 3.5kg. Another, on myxomatosis, was reprinted by Cambridge University Press last year, 44 years after the first edition came out. Fenner is chuffed, but disappointed that he could not update it with research confirming wild rabbits have developed resistance to the biological control agent. The study showed that myxo now had a much lower kill rate in the wild than in laboratory rabbits that had never been exposed to the virus. "The [wild] rabbits themselves had mutated," Fenner says. "It was an evolutionary change in the rabbits." His deep understanding of evolution has never diminished his fascination with observing it in the field. That understanding was shaped by studies of every scale, from the molecular level to the ecosystem and planetary levels. Fenner originally wanted to become a geologist but, on the advice of his father, studied medicine instead, graduating from the University of Adelaide in 1938. He spent his spare time studying skulls with prehistorian Norman Tindale. Soon after graduating, he joined the Royal Australian Army Medical Corps, serving in Egypt and Papua New Guinea. He is credited in part with Australia's victory in New Guinea because of his work to control malaria among the troops. "That quite changed my interest from looking at skulls to microbiology and virology," he says. But his later research in virology, focusing on pox viruses, took him also into epidemiology and population dynamics, and he would soon zoom out to view species, including our own, in their ecological context. His biological perspective is also geological. He wrote his first papers on the environment in the early 1970s, when human impact was emerging as a big problem. He says the Earth has entered the Anthropocene. Although it is not an official epoch on the geological timescale, the Anthropocene is entering scientific terminology. It spans the time since industrialisation, when our species started to rival ice ages and comet impacts in driving the climate on a planetary scale. Fenner says the real trouble is the population explosion and "unbridled consumption". The number of Homo sapiens is projected to exceed 6.9 billion this year, according to the UN. With delays in firm action on cutting greenhouse gas emissions, Fenner is pessimistic. "We'll undergo the same fate as the people on Easter Island," he says. "Climate change is just at the very beginning. But we're seeing remarkable changes in the weather already. "The Aborigines showed that without science and the production of carbon dioxide and global warming, they could survive for 40,000 or 50,000 years. But the world can't. The human species is likely to go the same way as many of the species that we've seen disappear. "Homo sapiens will become extinct, perhaps within 100 years," he says. "A lot of other animals will, too. It's an irreversible situation. I think it's too late. I try not to express that because people are trying to do something, but they keep putting it off.

### Overpopulation is happening now- causing global warming

CBD 11 [Center for Biological Diversity, “Overpopulation: a Key Factor in Species Extinction”, http://www.biologicaldiversity.org/campaigns/overpopulation/index.html, 2/17/2011]

The world’s human population doubled from 1 to 2 billion between 1800 and 1930, and then doubled again by 1975. Sometime in 2011, it’s expected to top 7 billion. This staggering increase and the massive consumption it drives are overwhelming the planet’s finite resources. We’ve already witnessed the devastating effects of overpopulation on biodiversity: Species abundant in North America two centuries ago — from the woodland bison of West Virginia and Arizona’s Merriam’s elk to the Rocky Mountain grasshopper and Puerto Rico’s Culebra parrot — have been wiped out by growing human numbers. As the world’s population grows unsustainably, so do its unyielding demands for water, land, trees and fossil fuels — all of which come at a steep price for already endangered plants and animals. Most biologists agree we’re in the midst of the Earth’s sixth mass extinction event; species are disappearing about 1,000 times faster than is typical of the planet’s history. This time, though, it isn’t because of geologic or cosmic forces but unsustainable human population growth. Today’s global human population stands at 6.9 billion. Every day, the planet sees a net gain of roughly 250,000 people. If the pace continues, we’ll be on course to reach 8 billion by 2020 and 9 billion by 2050. By any ecological measure, Homo sapiens sapiens has exceeded its sustainable population size. Just a single human waste product — greenhouse gas — has drastically altered the chemistry of the planet’s atmosphere and oceans, causing global warming and ocean acidification. In the United States, which has the world’s third largest population after China and India, the fertility rate peaked in 2007 at its highest level since 1971 before dropping off slightly due to the recent economic recession. At 2.1 children per woman, the U.S. fertility rate remains the highest among developed nations, which average around 1.6. The current U.S. population exceeds 300 million and is projected to grow 50 percent by 2050. The mission of the Center for Biological Diversity is to stop the planetary extinction crisis wiping out rare plants and animals around the world. Explosive, unsustainable human population growth is an essential root cause of this crisis.

## Nuclear War

### Nuclear war leads to extinction- colonization is key

Engdahl 08 [Sylvia Engdahl, science teacher and space advocate, “Space and Human Survival: My Views on the Importance of Colonizing Space,” 11-5, www.sylviaengdahl.com/space/survival.htm]

Until recently, the reason most commonly offered for believing our survival depends on space travel was that our species will need to move elsewhere in order to survive the ultimate death of our sun, or the possibility of our sun turning into a nova. (Scientists now believe that these specific scenarios won’t happen; but the sun will eventually become a red giant, which as far as Earth is concerned, is an equally disastrous one.) This is not of such remote concern as it may seem, as I’ll explain below. However, it surely is a remote event, billions of years in the future, and I don’t blame anyone for not giving it very high priority at present. It is far from being my main reason. A more urgent cause for concern is the need not to “put all our eggs in one basket,” in case the worst happens and we blow up our own planet, or make it uninhabitable by means of nuclear disaster or perhaps biological warfare. We would all like to believe this won’t happen, yet some people are seriously afraid that it will—it’s hardly an irrational fear. Peace with Russia may have drawn attention from it, yet there are other potential troublemakers, even terrorists; the nuclear peril is not mere history. Furthermore, there is the small but all-too-real possibility that Earth might be struck by an asteroid. We all hope and believe our homes won’t burn down, and yet we buy fire insurance. Does not our species as a whole need an insurance policy? Even Carl Sagan, a long-time opponent of using manned spacecraft where robots can serve, came out in support of space colonization near the end of his life, for this reason; see his book Pale Blue Dot. And in an interview with Britain’s newspaper Daily Telegraph, eminent cosmologist Stephen Hawking said, “I don’t think that the human race will survive the next thousand years unless we spread into space. There are too many accidents that can befall life on a single planet.” Hawking is more worried about the possibility of our creating a virus that destroys us than about nuclear disaster. However, he said, “I’m an optimist. We will reach out to the stars.”

## Extinction Inevitable

### Extinction is inevitable- nuke war, bioweapons, overpopulation, warming

Leslie 99 [John, Lifeboat Foundation Scientific Advisory Board member, “Risking Human Extinction”, http://lifeboat.com/ex/risking.human.extinction]

What chance has the human race of surviving the coming century, and perhaps further centuries? Comets and asteroids are very unlikely to exterminate us. During the next hundred years Earth may well be hit by something large enough to wipe out a city, or several cities if the thing hits an ocean, producing huge tidal waves. Yet even something much bigger, like the monster which exterminated the dinosaurs, probably would not be enough to kill all humans, and objects of that size arrive only about once in a hundred million years. Long before the next one did, humans should have spread far beyond their tiny planet so long as they had not exterminated themselves. How likely are they to do that? Let us look at various risks. First, there is nuclear warfare. There are still thousands of hydrogen bombs despite the collapse of the Soviet Union. Because of the chaos of its collapse, the threat of accidental nuclear war could well be greater than ever. Nitrogen oxides from a nuclear war might be disastrous to the ozone layer, Earth's shield against ultraviolet light. Also, nobody can be sure whether a "nuclear winter", severe cooling which lasted for months, would result from all the soot which burning cities and forests threw into the atmosphere. The radioactive fall out would work mischief too. Humans might be wiped out through the deaths of microorganisms which were crucial to the health of the biosphere. Biological warfare could be still more dangerous. Scientists could produce new diseases that spread more easily and killed far more efficiently than the Spanish 'flu which, appearing in 1918, ended more lives than the World War had just done. An aggressor nation's vaccines to protect itself could fail, in which case maybe everybody could be killed off. Do not say that nobody would be criminal enough to risk it! The world contains some very unpleasant individuals and, now that mammalian cells can be grown on tiny beads, a single bottle can produce viruses in numbers which previously required large factories. It is often population pressures which lead to warfare, and the world's population is still exploding. We have some six billion humans now, which means only very little usable land for each. There could be up to twelve billion humans by the end of the next century. Even without warfare, the environment could come under disastrous pressure. Many think it already is, thanks to such things as the unholy alliance between fertilizers and pesticides, the loss of forests, and the chlorofluorocarbons which continue to erode the ozone layer. Recent research suggests that in the northern hemisphere, during the crucial spring growing season, ozone losses will be double what had been estimated, because of how global greenhouse warming is linked to stratospheric cooling. And the warming might be disastrous just by itself. To get the consensus needed in 1992 for persuading the politicians in Rio, the International Panel on Climate Change disregarded worst case predictions, also dealing with biological feedback loops in just one sentence: "Biological feedbacks have not yet been taken into account."

### Humans face extinction by the end of the century- warming

Henzell 04 [John H. “Human extinction imminent”, The Press (Christchurch, New Zealand), 11/17/04, LexisNexis Academic]

A top New Zealand researcher is using a prestigious award ceremony in Christchurch to warn that humans face extinction by the end of the century. Professor Peter Barrett will be presented with the Marsden Medal tonight for his 40-year contribution to Antarctic research, latterly focusing on climate change. The director of Victoria University's Antarctic Research Centre expects to use his acceptance speech to warn climate change was a major threat to the planet. "After 40 years, I'm part of a huge community of scientists who have become alarmed with our discovery, that we know from our knowledge of the ancient past, that if we continue our present growth path, we are facing extinction," Barrett said. "Not in millions of years, or even millennia, but by the end of this century." Barrett won the award -- designed to mark lifetime achievement in the sciences -- for his research into Antarctica, which began with helping prove New Zealand was once part of the Gondwanaland supercontinent. He then changed disciplines, to predicting the impact of climate change. The result was a body of research on Antarctic ice sheets "which to our surprise is becoming increasingly relevant to the world as a consequence of global warming". Barrett's warning underlines comments he made last year that even the Kyoto Protocol on global warming would not be enough to avert a climate disaster. The United States and Australia have refused to adopt Kyoto protocol measures. "Research on the past Antarctic climate has an ominous warning for the future ..." he said. "We need an international commitment to an effective solution, if we are to survive the worst consequences of this grandest of all human experiments."

### Short timeframe for extinction- experts predict 100 years

The Economist 11[“Onward, Specks”, 5/9/11, http://www.economist.com/blogs/democracyinamerica/2011/05/futurology]

This newfound appreciation for the depths of time has led a handful of thinkers like [Sir Martin Rees, the Astronomer Royal], a theoretical cosmologist by training, to begin venturing some of humanity’s first real educated guesses about what may lie far, far, far ahead. Serious futurologists are not a large group yet. “It’s a fairly new area of inquiry,” says Nick Bostrom, an Oxford University philosophy professor who heads the school’s Future of Humanity Institute. But they are trying to give a first draft of a map of the future, using the kinds of rigor that theologians and uneducated guessers from previous generations didn’t have at their disposal. Broadly speaking, the futurologists are concerned with two questions—what's going to happen to the earth, and what's going to happen to the people living on it? Those are really different questions, and the first, at least, has a relatively straightforward answer. The earth is going to be just fine for millions and billions of years. Cosmologists get into the details, but the basic line is that it's going to be out in space, unthinkingly orbiting the sun, until the sun runs out and it does something else. So when we talk about "saving the planet" we really mean "save ourselves, please". That brings us to the second question. It also has a somewhat straightforward answer. As George W Bush put it, in the long run we'll all be dead. But how long is the long run? In 2003, Mr Rees gave it a 50/50 chance that humans will go extinct in the next hundred years; Mr Bostrom puts the odds of that at about 25%.

### Colonization is key to survival for many reasons

Leslie 99 [John, Lifeboat Foundation Scientific Advisory Board member, “Risking Human Extinction”, http://lifeboat.com/ex/risking.human.extinction]

Of all humans so far, roughly ten per cent are alive with you and me. If human extinction occurred soon, our position in population history would have been fairly ordinary. But if, in contrast, humankind survived for many more centuries, perhaps colonizing the galaxy, then we could easily be among the earliest 0.001 per cent of all humans who will ever have lived. This could seem a very surprising position to be in — a point which is crucial to a "doomsday argument" originated by the cosmologist Brandon Carter. People who accept the argument, even in a weakened form which takes account of the fact that the world is probably indeterministic, will re-estimate the size of the threats to humankind, showing increased reluctance to believe that humans will survive for very long. Possible threats include nuclear and biological warfare; ozone layer destruction; greenhouse warming of a runaway kind; an environmental crisis caused by overpopulation; new diseases; disasters from genetic engineering or from nanotechnology; computers replacing humans entirely, as some people think would be desirable; the upsetting of a space-filling scalar field through an experiment at very high energies, as discussed in a recent book by England's Astronomer Royal; and even the arguments of the many philosophers who see no duty to keep the human race in existence. But despite all such dangers and despite Carter's disturbing argument, humans may well have a good chance of surviving the next five centuries.

### Extinction is unavoidable- overpopulation and global warming

The Australian 10 [Cheryl Jones, 6/16/10, “Frank Fenner sees no home for humans”, http://www.theaustralian.com.au/higher-education/frank-fenner-sees-no-hope-for-humans/story-e6frgcjx-1225880091722]

FRANK Fenner doesn't engage in the skirmishes of the climate wars. To him, the evidence of global warming is in. Our fate is sealed. "We're going to become extinct," the eminent scientist says. "Whatever we do now is too late." Fenner is an authority on extinction. The emeritus professor in microbiology at the Australian National University played a leading role in sending one species into oblivion: the variola virus that causes smallpox. And his work on the myxoma virus suppressed wild rabbit populations on farming land in southeastern Australia in the early 1950s. He made the comments in an interview at his home in a leafy Canberra suburb. Now 95, he rarely gives interviews. But until recently he went into work each day at the ANU's John Curtin School of Medical Research, of which he was director from 1967 to 1973. Decades after his official retirement from the Centre for Resource and Environmental Studies, which he set up in 1973, he continued a routine established when he was running world-class facilities while conducting research. He'd get to work at 6.30am to spend a couple of hours writing textbooks before the rest of the staff arrived. Fenner, a fellow of the Australian Academy of Science and of the Royal Society, has received many awards and honours. He has published hundreds of scientific papers and written or co-written 22 books. He retrieves some of the books from his library. One of them, on smallpox, has physical as well as intellectual gravitas: it weighs 3.5kg. Another, on myxomatosis, was reprinted by Cambridge University Press last year, 44 years after the first edition came out. Fenner is chuffed, but disappointed that he could not update it with research confirming wild rabbits have developed resistance to the biological control agent. The study showed that myxo now had a much lower kill rate in the wild than in laboratory rabbits that had never been exposed to the virus. "The [wild] rabbits themselves had mutated," Fenner says. "It was an evolutionary change in the rabbits." His deep understanding of evolution has never diminished his fascination with observing it in the field. That understanding was shaped by studies of every scale, from the molecular level to the ecosystem and planetary levels. Fenner originally wanted to become a geologist but, on the advice of his father, studied medicine instead, graduating from the University of Adelaide in 1938. He spent his spare time studying skulls with prehistorian Norman Tindale. Soon after graduating, he joined the Royal Australian Army Medical Corps, serving in Egypt and Papua New Guinea. He is credited in part with Australia's victory in New Guinea because of his work to control malaria among the troops. "That quite changed my interest from looking at skulls to microbiology and virology," he says. But his later research in virology, focusing on pox viruses, took him also into epidemiology and population dynamics, and he would soon zoom out to view species, including our own, in their ecological context. His biological perspective is also geological. He wrote his first papers on the environment in the early 1970s, when human impact was emerging as a big problem. He says the Earth has entered the Anthropocene. Although it is not an official epoch on the geological timescale, the Anthropocene is entering scientific terminology. It spans the time since industrialisation, when our species started to rival ice ages and comet impacts in driving the climate on a planetary scale. Fenner says the real trouble is the population explosion and "unbridled consumption". The number of Homo sapiens is projected to exceed 6.9 billion this year, according to the UN. With delays in firm action on cutting greenhouse gas emissions, Fenner is pessimistic. "We'll undergo the same fate as the people on Easter Island," he says. "Climate change is just at the very beginning. But we're seeing remarkable changes in the weather already. "The Aborigines showed that without science and the production of carbon dioxide and global warming, they could survive for 40,000 or 50,000 years. But the world can't. The human species is likely to go the same way as many of the species that we've seen disappear. "Homo sapiens will become extinct, perhaps within 100 years," he says. "A lot of other animals will, too. It's an irreversible situation. I think it's too late. I try not to express that because people are trying to do something, but they keep putting it off.

### Extinction is unavoidable- technological self destruction will come before natural causes

Falconi 81[Oscar, “THE CASE FOR SPACE COLONIZATION - NOW! - and why it should be our generation's #1 priority.”, http://www.nutri.com/space/]

Unfortunately, mankind reproduces itself in series. One generation begets the next. When one generation ceases to exist all future generations are lost. In the past, the human race was well dispersed, with little possibility for self-destruction. There was no reason to think that the existent generation might be the last. But times have changed. With weaponry and research advancing furiously, it could well be that our chance for self-destruction is doubling every year or two. Carl Sagan, in a recent episode of his very fine TV series, "Cosmos", has reasoned that the chance of human life continuing to exist on earth is less than 1% per century. This is equivalent to less than a 50-50 chance of lasting the next 15 years! As it stands now, it appears that most Americans (half are less than 30) will die a violent death. When the odds against us are bad, and rapidly getting worse, it's time to search for a solution. But it's impossible to solve the problem of preventing, with 100% certainty, our self-destruction here on earth. This problem is just too complicated, and asks too much of man - such as restraint, understanding, objectivity, intelligence, compromise, and common sense - characteristics which are necessary for future survival, but seldom met with in practice, particularly in politics. We are now left in the ludicrous position of hoping we'll survive through each year. But the hope that no unforeseen catastrophe will destroy man is a flimsy basis on which to assume that our species will enjoy its maximum possible time in this universe. If you want insurance, you've got to pay the premium. And the premium is due now. The only known life in the universe exists on earth, and, for a surprisingly large number of reasons, could soon find itself destroyed. Man is particularly susceptible to such a tragedy compared to the crustaceans, amphibians, insects, and the countless other hardy families. Only his superior brain has enabled him to successfully compete despite a relatively fragile constitution. Should we succeed in our self-destruction, it's doubtful that nature could once again turn the trick of creating another highly advanced being out of any primitive life remaining on earth. By whatever philosophical standards one bases his thinking, one must conclude that life is better than no life at all. Man's first thought must be to preserve the human race at all costs. It must not be allowed to come to an end, and specifically, it mustn't be allowed to destroy itself. In the far distant future, it appears that man will be doomed by the lack of available energy (the 2nd law). This may not come about for 100's of billions of years. Before that, a collapsing universe may put an end to all life. And before that, our sun will become a red giant, probably ending all life in our solar system. But even that won't come about for several billions of years. Whether these problems can be solved isn't known, but man has plenty of time to think about them. More imminent, not in billions of years, but maybe in just a fraction of a decade, is the end of all life on earth that man himself has the capability to bring about!

## Colonization key to survival

### Space colonization key to human survival-nuclear and biological weapons are threats

Hawking 01 [Prof. Steven, “URGENT UPDATE: A 16th Oct. 2001 WARNING by Cosmologist”, 10/16/01, http://www.nutri.com/space/]

"The human race is likely to be wiped out by a doomsday virus . . . unless we set up colonies in space. Although Sept. 11th was horrible, it didn't threaten the survival of the human race like nuclear weapons do," said the Cambridge University Scientist. "In the long term, I'm more worried about biology. Nuclear weapons need large facilities, but genetic engineering can be done in a small lab. The danger is that, either by accident or design, we create a virus that destroys us. I don't think the human race will survive . . unless we spread into space. There are too many accidents that can befall life on a single planet." All of the above concerns were expressed a quarter century ago in this following article by Mr. Falconi. BUT, the "original" concept of escaping from earth in order to back up and preserve our civilization, as expressed by Mr. Falconi, was preconceived by over a quarter-century in the following prophetic paragraph: "We must keep the problems of today in true proportions: they are vital - indeed of extreme importance - since they can destroy our civilisation and slay the future before its birth. The crossing of space may do much to turn men's minds outwards and away from their present tribal squabbles. In this sense, the rocket, far from being one of the destroyers of civilisation, may provide the safety valve that is needed to preserve it."

### Colonization is the only way to prevent self destruction

Falconi 81[Oscar, “THE CASE FOR SPACE COLONIZATION - NOW! - and why it should be our generation's #1 priority.”, http://www.nutri.com/space/]

If man can populate the universe to a density of just one person per cubic light year, then, over the next 100 billion years, we can enjoy some 10-to-the-40th-power man-years. This is very conservative. From energy considerations the universe may be able to support as many as 10-to-the-60th man-years. We have used up about a trillion so far, leaving us over 9.99 x 10-to-the-59th man-years of productivity and happiness. So, that is what may be at stake. If it were possible to know, it's certain that every yet-unborn person would appeal to us that we must, at all costs, assure his existence by immediately taking steps to prevent our self-destruction. Life on earth will certainly cease to exist some day, but can we predict how soon? Unfortunately, every science (except mathematics) is based upon laboratory and field observations of the world as it's handed to us. The experimentalists are usually far ahead of the theorists who spend the great majority of their time trying to explain what has been observed. It's clear, since we're almost always one step behind in our understanding of the facts, that no advance warning of our imminent demise can be expected from the theorists. Since our scientists can't enlighten us, what about our politicians? Can they somehow control the geometrically increasing indicators (population, energy, etc.) and peacefully level them out to a stable plateau? Or will there be some sort of earthly "big bang"? One might only predict from the manner in which world leaders have solved their problems in the past, and by judging the caliber of our leadership in the world today. It may be that the only way we can have of predicting the time by which we should set up our colony is to look at the curves that depict these geometrically increasing indicators of impending disaster. These rates of increase surely cannot be maintained for many years - and so we must get on with the construction of space colonies - Now!

### Colonization is key to extinction- natural and man-made disasters destroy Earth

Huang 04[Michael Huang, “Spaceflight or Extinction. http://www.spaext.com/]

The aim of astronautics is “to extend life to there”, to establish habitats beyond Earth. This should be achieved not only for its intrinsic value, but to ensure the safety of the human species through a critical stage of its development. A civilization restricted to the surface of a single planet has inevitable threats to its long-term existence. Natural threats such as epidemics and impacts from space objects, and man-made threats such as nuclear and biological war, will be joined by new threats from emerging sciences and technologies. If we have self-sufficient human settlements throughout the solar system, and access to life support technology on Earth, humankind would have a secure future. A global catastrophe, although terrible, would not end the human species and the potential of a universe filled with intelligent life. We have a choice between two possible futures: spaceflight or extinction. To do nothing is a choice for the second future. The aim of this web site is to contribute towards the first.

### Solvency: Colonizing space saves the human race.

The Times of India, 10 (“Colonizing space can save us from extinction: Hawking”, August 10th, 2010, Access Date-7/15/11).

Unless humans colonize space within the next two centuries, they will become extinct, noted astrophysicist Stephen Hawking has warned adding, "Our only chance of long term survival is not to remain on planet Earth." In an interview with 'Big Think' portal, Hawking said he's an "optimist" but the next few hundred years had to be negotiated carefully if the human race is to survive. He said, "I see great danger for the human race. There have been a number of times in the past when survival has been a question of touch and go. The Cuban missile crisis in 1963 is one of these. "The frequency of such occasions is likely to increase in the future. We shall need great care and judgment to negotiate them all successfully. But I am an optimist. If we can avoid disaster for the next two centuries our species should be safe as we spread into space."

## Colonization key to economy and overpopulation

### Colonization is key to overpopulation-solves economy

Howerton 96 [Alexander Howerton, Editor at Countdown News, “Why bother about space?”, http://www.allbusiness.com/professional-scientific/scientific-research/536396-1.html, 1/1/1996]

The two most prevalent arguments to support space exploration are that it is humanity's destiny to go to the stars (because humans are natural explorers) and that the myriad of spin-off technologies from the space program have significantly improved our lives. While I agree with both of these arguments, they are vaguely unsatisfying as justifications for a multibillion-dollar enterprise that may span several generations. Just as many spin-offs can be created by investing in high-tech developments on Earth, and if you want exploration and adventure, the ocean trenches await. There are, however, several compelling arguments for the exploration and development of space. The economic argument is this: The greatest good a government attempts to achieve for its people is to provide them with the conditions in which they may work to create a better life for themselves. Although this ideal is fraught with many pitfalls, it has been the guiding principle of western democracies for over two centuries, and with the collapse of the Soviet Union, many countries have joined this grand experiment. The best method for creating these conditions is an ever-growing economy. We are currently witnessing the damaging effects of stagnant or recessed economies around the globe. People who feel that they have lost their opportunities for advancement or who feel that others are taking those opportunities from them are much easier to persuade to hate, kill, or go to war. Therefore, many governments consider it imperative to keep their economy growing at almost any cost. The opening of eastern Europe and the ongoing development of the Third World make it appear as if there is much more room for growth in the global economy, but ultimately the earth is a closed system with finite resources. If we try to keep our economy growing forever based on the finite resources of the earth, we will one day run out. We must keep the economy growing, because the population of the planet is experiencing an exponential increase. Most attempts to curb population growth have been unsuccessful, yet it has been discovered that the best method of population control is a high standard of living. And that is achieved through an ever-expanding economy. The only way to keep the economy expanding infinitely is to expand our resource base infinitely. The universe is a big place. Human ingenuity is such that we will find innumerable ways to economically prosper in space. The list of known methods already includes solar power satellites, lunar helium-3 production, asteroid mining, hydroponic agriculture, and tourism, just to name a few. We need only a few visionaries to realize the magnitude of the carrot of space development in front of them and the stick of global depression behind them to jump-start the space economy. The explosion of new industries and jobs created in their wake will dwarf any economic expansion that has heretofore occurred in human history. Poverty would diminish worldwide as the growing labor requirements of the new space industries put more and more people to work. Moreover, as we progress into space, new opportunities will be developed, further compounding the positive economic effects. We will have escaped the trap of a closed, cyclical economy; the riches of the solar system will lie before us.

# HE3 Advantage

## 1AC – HE3 Advantage

### Resource wars coming unless we switch energy

Peters 09 [“Courting Future Resource Conflict: The Shortcomings of Western Response Strategies to New Energy Vulnerabilities”, july 29, 2009, Susanne Peters]

With the phenomenon of economic globalization having absorbed our attention for the last decade, environmental challenges as well as the necessity to manage the distribution of resources have been neglected. This paper focuses on the potential for future resource conflicts among states which - as will be argued - will be fought along the axis of the consumers and producers of energy. Conflict over resources can be provoked by the increased energy import dependency of some Western states, intensified by a progressive process of global fossil fuels depletion. The strategies of the West to prevent and manage this type of conflict - risk reduction, crisis management and geopolitics of energy - will be evaluated according to their effectiveness. It will be argued that these strategies might be effective in the short- and mid term but are inadequate in the long term, and that Western states cannot depend on them to prevent a conflict over fossil fuels. The focus of the study is the EU and its precarious strategy of "risk reduction" which, in effect, places all the eggs in the Russian basket. The discussion of Western crisis management as implemented by the International Energy Agency also points to their lack of reliability and effectiveness to manage a severe shortage crisis. The third strategy to prevent and manage supply crisis for the West - a geopolitics of energy - might work in the short run by furnishing Western states' control of cheap oil, but is counterproductive in the long run by deepening the chasm between them and the producer countries on whose energy they depend. The only two effective and complementary strategies to avoid conflict over resources would be to start to reduce the dependency on fossil fuels by developing alternative and renewable energy, and, most of all, to pursue a global policy based on a more equitable and controlled energy distribution.

### Resource scarcity causes wars – empirically proven

Hsu 5/13 [Jeremy Hsu – interview report with Christine Parthemore - Fellow at the Center for a New American Security (CNAS ), where she directs the Natural Security Program, http://www.cnas.org/node/6361, May 13, 2011]

May 13, 2011 — Conflict over natural resources may well go beyond oil in the 21st century. Rising powers such as China and India race for strategic control of energy and mineral supplies around the world, even as the U.S., Canada, Russia and European countries circle around the rich resources of the melting Arctic. Even shrinking fisheries spark armed disputes and piracy in regions ranging from Southeast Asia to Somalia. That means U.S. national security must also consider both non-renewable and renewable natural resources, says Christine Parthemore, director of the natural security program for the Center for a New American Security. Parthemore talked with InnovationNewsDaily about how the U.S. military can get beyond oil dependency, climate change disruptions, and the future resource wars. She recently discussed her latest report about the vulnerability of global supply chains for irreplaceable minerals used by U.S. military hardware. InnovationNewsDaily: How have natural resources played a role in sparking conflict historically, and has that changed at all in the 21st century? Christine Parthemore: Conflicts are not generally sparked by one variable, whether that’s natural resources or political disputes. That said, natural resources often play a role in the political, economic and security trends that do lead to conflict. This century has already seen vast changes in how countries trade, produce and consume natural resources, with rising demand counting as one of the most important trends. To me, the trump card is the prominent role Asian countries like China, Japan, South Korea and India will play in the 21st century. Each of these countries considers energy, minerals, food supplies and other natural resources to be of very high strategic importance, and this automatically elevates the role resources will play in all political affairs — whether that’s conflict or cooperation.

### He3 mining makes nuclear fusion possible – Solves energy dependence, and outweighs transportation costs

Coledan 04 [Stefano Coledan – aerospace consultant at Radiotelevisione Italiana “Mining The Moon”, 12-7-04, http://www.popularmechanics.com/science/space/moon-mars/1283056, Popular Mechanics]

A sample of soil from the rim of Camelot crater slid from my scoop into a Teflon bag to begin its trip to Earth with the crew of Apollo 17. Little did I know at the time, on Dec. 13, 1972, that sample 75501, along with samples from Apollo 11 and other missions, would provide the best reason to return to the moon in the 21st century. That realization would come 13 years later. In 1985, young engineers at the University of Wisconsin discovered that lunar soil contained significant quantities of a remarkable form of helium. Known as helium-3, it is a lightweight isotope of the familiar gas that fills birthday balloons. Small quantities of helium-3 previously discovered on Earth intrigued the scientific community. The unique atomic structure of helium-3 promised to make it possible to use it as fuel for nuclear fusion, the process that powers the sun, to generate vast amounts of electrical power without creating the troublesome radioactive byproducts produced in conventional nuclear reactors. Extracting helium-3 from the moon and returning it to Earth would, of course, be difficult, but the potential rewards would be staggering for those who embarked upon this venture. Helium-3 could help free the United States--and the world--from dependence on fossil fuels.

### Fusion would lower oil prices and help developing nations – Solves resource wars

D’Souza, Otalvaro, Singh 06 [“HARVESTING HELIUM-3 FROM THE MOON”, Marsha R. D’Souza, Diana M. Otalvaro, Deep Arjun Singh. Februry 17, 2006]

A more likely scenario from a technical standpoint, however, is to bring He-3 from the Moon to Earth to be reacted in the plasma reactors. This would allow use of the existing gridlines for delivering electricity and would eliminate the production of H2 as an intermediate agent. This scenario presupposes that the He-3-Deuterium reactor is fully developed, which even according to experts in the field (see interview with Dr. Kulcinski) is a long term venture. Because the reactor is most highly developed in the United States, it would seem this country has an initial advantage. If we suppose that He- 3 would become the primary energy source to power the United States and that it would become so before the end of the fuel era, **this would imply that the fossil fuel prices would plummet since the primary consumer would be out of the game.** This would allow developing nations to purchase larger amounts of oil which could lead to their faster development. Under this scenario India and China would again be the dominating economies within the developing countries, since they have the resources to purchase the largest amounts in a fuel market governed entirely by demand and supply dynamics. These nations also have the greatest projected need for fuel. On the other hand, if China and India develop their own He-3-Deuterium reactors, they would enter in direct competition with the US for He-3. In what manner this competition will be carried out depends largely on how closely these countries abide to international treaties and on how much they are willing to cooperate with one another.

### The shortage of He3 is destroying the economy

Brown 10 [October 2010 “Lack of Helium-3 Sounding Alarms”, David – explorer correspondent. http://www.aapg.org/explorer/2010/10oct/helium1010.cfm]

A Costly Shortage How bad is the shortage? The U.S. Department of Energy reportedly has less than a one-year supply. Russia, another helium-3 seller, has essentially stopped exporting it. While natural gas recently sold for under $4 per thousand cubic feet at the wellhead, and the U.S. Bureau of Land Management raised helium gas prices to $75 per thousand cubic feet, helium-3 now typically sells for at least $500 per liter. “Two years ago it was $85 a liter. Government agencies didn’t know the U.S. was running out of helium-3 until 2008,” Sears said. At least one reported helium-3 purchase was for more than $2,000 per liter. When the severity of the shortage became apparent earlier this year, alarms went off throughout the scientific community, especially among those researchers who had no substitute for helium-3. The same concern has spread to companies that need helium-3 for commercial applications. Supplies of the common form of helium found on Earth, helium-4, also are shrinking. That’s an ironic reality, since helium itself is the second most common element in the solar system. Helium-3 also is fairly abundant, scattered among the planets, in the soil of the Moon, in the Earth’s mantle. But even though it’s present in the Earth, it is increasingly scarce on the Earth. Inter-American explores for natural gas that contains a significant amount of recoverable helium, Sears said. He acknowledged that helium exploration is a tiny part of the overall industry. “We’re a traditional oil and gas company but we’ve begun focusing on helium exploration. In our case it makes more sense to go after the high helium-4 reserves,” he noted. Even when helium is found with natural gas, the percentage content is usually small. “Economic helium is anywhere from 0.3 percent up to the highest we’ve seen, which was 9 percent. That was in the Four Corners area and that supply was exhausted in the 1960s,” Sears said. “Ideally,” he added, “we’d want a helium composition of at least 1 percent.”

**Global economic crisis causes nuclear great-power war**

Mead 9 – Walter Russell Mead, the Henry A. Kissinger Senior Fellow in U.S. Foreign Policy at the Council on Foreign Relations, 2-4, 2009, “Only Makes You Stronger,” The New Republic, http://www.tnr.com/politics/story.html?id=571cbbb9-2887-4d81-8542-92e83915f5f8&p=2

If current market turmoil seriously damaged the performance and prospects of India and China, the current crisis could join the Great Depression in the list of economic events that changed history, even if the recessions in the West are relatively short and mild. The United States should stand ready to assist Chinese and Indian financial authorities on an emergency basis--and work very hard to help both countries escape or at least weather any economic downturn. It may test the political will of the Obama administration, but the United States must avoid a protectionist response to the economic slowdown. U.S. moves to limit market access for Chinese and Indian producers could poison relations for years. For billions of people in nuclear-armed countries to emerge from this crisis believing either that the United States was indifferent to their well-being or that it had profited from their distress could damage U.S. foreign policy far more severely than any mistake made by George W. Bush.

It's not just the great powers whose trajectories have been affected by the crash. Lesser powers like Saudi Arabia and Iran also face new constraints. The crisis has strengthened the U.S. position in the Middle East as falling oil prices reduce Iranian influence and increase the dependence of the oil sheikdoms on U.S. protection. Success in Iraq--however late, however undeserved, however limited--had already improved the Obama administration's prospects for addressing regional crises. Now, the collapse in oil prices has put the Iranian regime on the defensive. The annual inflation rate rose above 29 percent last September, up from about 17 percent in 2007, according to Iran's Bank Markazi. Economists forecast that Iran's real GDP growth will drop markedly in the coming months as stagnating oil revenues and the continued global economic downturn force the government to rein in its expansionary fiscal policy.

All this has weakened Ahmadinejad at home and Iran abroad. Iranian officials must balance the relative merits of support for allies like Hamas, Hezbollah, and Syria against domestic needs, while international sanctions and other diplomatic sticks have been made more painful and Western carrots (like trade opportunities) have become more attractive. Meanwhile, Saudi Arabia and other oil states have become more dependent on the United States for protection against Iran, and they have fewer resources to fund religious extremism as they use diminished oil revenues to support basic domestic spending and development goals. None of this makes the Middle East an easy target for U.S. diplomacy, but thanks in part to the economic crisis, the incoming administration has the chance to try some new ideas and to enter negotiations with Iran (and Syria) from a position of enhanced strength.

Every crisis is different, but there seem to be reasons why, over time, financial crises on balance reinforce rather than undermine the world position of the leading capitalist countries. Since capitalism first emerged in early modern Europe, the ability to exploit the advantages of rapid economic development has been a key factor in international competition. Countries that can encourage--or at least allow and sustain--the change, dislocation, upheaval, and pain that capitalism often involves, while providing their tumultuous market societies with appropriate regulatory and legal frameworks, grow swiftly. They produce cutting-edge technologies that translate into military and economic power. They are able to invest in education, making their workforces ever more productive. They typically develop liberal political institutions and cultural norms that value, or at least tolerate, dissent and that allow people of different political and religious viewpoints to collaborate on a vast social project of modernization--and to maintain political stability in the face of accelerating social and economic change. The vast productive capacity of leading capitalist powers gives them the ability to project influence around the world and, to some degree, to remake the world to suit their own interests and preferences. This is what the United Kingdom and the United States have done in past centuries, and what other capitalist powers like France, Germany, and Japan have done to a lesser extent. In these countries, the social forces that support the idea of a competitive market economy within an appropriately liberal legal and political framework are relatively strong.

But, in many other countries where capitalism rubs people the wrong way, this is not the case. On either side of the Atlantic, for example, the Latin world is often drawn to anti-capitalist movements and rulers on both the right and the left. Russia, too, has never really taken to capitalism and liberal society--whether during the time of the czars, the commissars, or the post-cold war leaders who so signally failed to build a stable, open system of liberal democratic capitalism even as many former Warsaw Pact nations were making rapid transitions. Partly as a result of these internal cultural pressures, and partly because, in much of the world, capitalism has appeared as an unwelcome interloper, imposed by foreign forces and shaped to fit foreign rather than domestic interests and preferences, many countries are only half-heartedly capitalist. When crisis strikes, they are quick to decide that capitalism is a failure and look for alternatives.

So far, such half-hearted experiments not only have failed to work; they have left the societies that have tried them in a progressively worse position, farther behind the front-runners as time goes by. Argentina has lost ground to Chile; Russian development has fallen farther behind that of the Baltic states and Central Europe. Frequently, the crisis has weakened the power of the merchants, industrialists, financiers, and professionals who want to develop a liberal capitalist society integrated into the world. Crisis can also strengthen the hand of religious extremists, populist radicals, or authoritarian traditionalists who are determined to resist liberal capitalist society for a variety of reasons. Meanwhile, the companies and banks based in these societies are often less established and more vulnerable to the consequences of a financial crisis than more established firms in wealthier societies.

As a result, developing countries and countries where capitalism has relatively recent and shallow roots tend to suffer greater economic and political damage when crisis strikes--as, inevitably, it does. And, consequently, financial crises often reinforce rather than challenge the global distribution of power and wealth. This may be happening yet again.

None of which means that we can just sit back and enjoy the recession. History may suggest that financial crises actually help capitalist great powers maintain their leads--but it has other, less reassuring messages as well. If financial crises have been a normal part of life during the 300-year rise of the liberal capitalist system under the Anglophone powers, so has war. The wars of the League of Augsburg and the Spanish Succession; the Seven Years War; the American Revolution; the Napoleonic Wars; the two World Wars; the cold war: The list of wars is almost as long as the list of financial crises.

Bad economic times can breed wars. Europe was a pretty peaceful place in 1928, but the Depression poisoned German public opinion and helped bring Adolf Hitler to power. If the current crisis turns into a depression, what rough beasts might start slouching toward Moscow, Karachi, Beijing, or New Delhi to be born?

The United States may not, yet, decline, but, if we can't get the world economy back on track, we may still have to fight.

### The moon is full of He3 and energy

Moon Daily, 04 [Moon Daily, “Moon Could Meet Earth’s Future Energy Demands: Scientists”, Nov. 26, 2004]

A potential energy source found on the moon's surface could hold the key to meeting future energy demands as the earth's fossil fuels dry up in the coming decades, scientists said last Friday. Mineral samples from the moon contained abundant quantities of helium 3, a variant of the gas used in lasers and refrigerators as well as to blow up balloons. "When compared to the earth the moon has a tremendous amount of helium 3," said Lawrence Taylor, a director of the US Planetary Geosciences Institute, Department of Earth and Planetary Sciences. "When helium 3 combines with deuterium (an isotope of hydrogen) the fusion reaction proceeds at a very high temperature and it can produce awesome amounts of energy," Taylor told AFP. "Just 25 tonnes of helium, which can be transported on a space shuttle, is enough to provide electricity for the US for one full year," said Taylor, who is in the north Indian city of Udaipur for a global conference on moon exploration. Helium 3 is deposited on the lunar surface by solar winds and would have to be extracted from moon soil and rocks. To extract helium 3 gas the rocks have to be heated above 1,400 degs Fdegs C). Some 200 million tonnes of lunar soil would produce one tonne of helium, Taylor said, noting that only 10 kilos of helium are available on earth. Indian President A.P.J. Abdul Kalam told the International Conference on Exploration and Utilisation of the Moon on Wednesday that the barren planet held about one million tonnes of helium 3. "The moon contains 10 times more energy in the form of Helium 3 than all the fossil fuels on the earth," Kalam said.

### Colonizing the moon solves – mining He3 there sets up a new energy source, economy, and global diplomacy

Evans 09 [James – Assistant Professor of Sociology “Mining the Moon: Helium 3 could revolutionalize the world” December 5, 2009]

Imagine a world that is not dependent on petroleum and fossil fuels, a world which has taken a giant leap forward towards space colonization. Although this may seem like an impossibility, this utopia is getting closer to becoming a reality and I welcome it with open arms. Currently The American Institute of Aeronautics and Astronautics Space Colonization Technical Committee is developing plans to have a moon base established as early as 2015 according to a position statement on www.aiaa.org. Aside from the obvious interest of lunar colonization, a rare type of Helium called Helium 3 could be mined from the surface of the moon and then transferred by shuttlecraft to Earth. H3 is what powers our Sun. Particles of the element are pushed off from the sun and then bombarded by cosmic rays which knock neutrons out of the Helium particles. The particles then combine, forming H3. The benefits of H3 are unquestionable. The compound can be used a safer fuel for nuclear reactors. Just the concept of safer nuclear power plants excites me. But unfortunately there are only small amounts of H3 on Earth. There is enough to be studied but not be utilized. The Earth-bound H3 burns up in the atmosphere, where as the moon has no atmosphere and is therefore literally coated with the compound. The reason we would want to harness the power of H3 is due to its incredibly low rate of radioactivity. The dangers of a nuclear fusion reactor would be reduced to only minor threats according to popularmechanics.com. H3 will not wear down nuclear reactors as fast as Uranium, therefore reducing the cost needed to replace the reactors. My question is, why are we not publicizing this? It's a great idea. The ability to colonize the moon and reduce the use of our depleting fossil fuels is an invaluable resource. As long as our Sun exists we would never run out of H3. For the first time the world would be looking at an infinite supply of energy. Aside from the elimination of highly-radioactive reactors and reduction of the use of fossil fuels the moon mining would create a whole new section for the global economy. The AIAASCTC's document asks for the United States to set up the lunar colony with the help of other international space agencies, so a free-market economy would be created for the area of mining and scientific research. This process would narrow the dividing lines between our country and other countries with space-exploration programs. I just hope we as a people are able to put our greed aside. This new development would be a major step forward towards global peace and understanding because of the need for several countries to work as one. Lastly, this would take us closer to the possibility of deep space exploration. It would be the first steps towards colonizing Mars. Telescopes could be set up on the surface of the Moon to view deeper parts of space with out any interference from an atmosphere. For these reasons, lunar colonization would launch us into a new area of progress for our economy and civilization.

### Now is the key time – China, India, Japan, Germany, and Russia are all aiming to mine the moon

Williams 07 [“Mining the Moon”, August 23, 2007, Mark Williams – researcher at the University of Wisconsin-Madison’s Fusion Technology Institute. http://www.technologyreview.com/Energy/19296/]

At the 21st century's start, few would have predicted that by 2007, a second race for the moon would be under way. Yet the signs are that this is now the case. Furthermore, in today's moon race, unlike the one that took place between the United States and the U.S.S.R. in the 1960s, a full roster of 21st-century global powers, including China and India, are competing. Even more surprising is that one reason for much of the interest appears to be plans to mine helium-3--purportedly an ideal fuel for fusion reactors but almost unavailable on Earth--from the moon's surface. NASA's Vision for Space Exploration has U.S. astronauts scheduled to be back on the moon in 2020 and permanently staffing a base there by 2024. While the U.S. space agency has neither announced nor denied any desire to mine helium-3, it has nevertheless placed advocates of mining He3 in influential positions. For its part, Russia claims that the aim of any lunar program of its own--for what it's worth, the rocket corporation Energia recently started blustering, Soviet-style, that it will build a permanent moon base by 2015-2020--will be extracting He3. The Chinese, too, apparently believe that helium-3 from the moon can enable fusion plants on Earth. This fall, the People's Republic expects to orbit a satellite around the moon and then land an unmanned vehicle there in 2011. Nor does India intend to be left out. (See "India's Space Ambitions Soar.") This past spring, its president, A.P.J. Kalam, and its prime minister, Manmohan Singh, made major speeches asserting that, besides constructing giant solar collectors in orbit and on the moon, the world's largest democracy likewise intends to mine He3 from the lunar surface. India's probe, Chandrayaan-1, will take off next year, and ISRO, the Indian Space Research Organization, is talking about sending Chandrayaan-2, a surface rover, in 2010 or 2011. Simultaneously, Japan and Germany are also making noises about launching their own moon missions at around that time, and talking up the possibility of mining He3 and bringing it back to fuel fusion-based nuclear reactors on Earth.

## Mining Feasible

### Mining He3 is not difficult by monetary or physical standards

Coledan 04 [Stefano Coledan – aerospace consultant at Radiotelevisione Italiana “Mining The Moon”, 12-7-04, http://www.popularmechanics.com/science/space/moon-mars/1283056, Popular Mechanics]

Lunar Mining Samples collected in 1969 by Neil Armstrong during the first lunar landing showed that helium-3 concentrations in lunar soil are at least 13 parts per billion (ppb) by weight. Levels may range from 20 to 30 ppb in undisturbed soils. Quantities as small as 20 ppb may seem too trivial to consider. But at a projected value of $40,000 per ounce, 220 pounds of helium-3 would be worth about $141 million. Because the concentration of helium-3 is extremely low, it would be necessary to process large amounts of rock and soil to isolate the material. Digging a patch of lunar surface roughly three-quarters of a square mile to a depth of about 9 ft. should yield about 220 pounds of helium-3--enough to power a city the size of Dallas or Detroit for a year. **Although considerable lunar soil would have to be processed, the mining costs would not be high by terrestrial standards**. Automated machines might perform the work. Extracting the isotope would not be particularly difficult. Heating and agitation release gases trapped in the soil. As the vapors are cooled to absolute zero, the various gases present sequentially separate out of the mix. In the final step, special membranes would separate helium-3 from ordinary helium.

### He3 mining is feasible – it retrieves more than enough energy for a round trip to the moon

Schirber 11 [Michael – LiveScience, MSNBC, “How moon rocks could power the future”, 8/13/2008, ©2011]

Such a mining operation would retrieve 300 times more energy than it uses (including all the energy to fly to the moon and back), Kulcinski estimates. In comparison, mining coal returns 15-20 times the energy put in. His team has estimated that it might cost around $800 million to bring back each ton of lunar helium-3. This might sound like a lot, but if you could sell the fusion energy at a price comparable to gasoline based on oil at $100 per barrel, the helium-3 would be worth $10 billion per ton.

## Colonization Solves Mining

### A lunar colony would be able to mine He3

Prado 02 [Projects to Employ Resources of the Moon and Asteroids Near Earth in the Near Term aka PERMANENT, Mark Prado ©2002, “2.4 Moon Bases”

The objective of the early lunar base is to get material into orbit so that products and services can be sold to support space development. Some studies have the lunar base making components on the surface of the Moon and blasting them up. However, it may be better to send a minimal lunar base to collect semi-processed minerals, and to locate most of the processing industry in orbital space. There are advantages to industry located in orbit -- continuous solar energy with no nights for power and thermal energy, huge solar ovens, gravities from zero to whatever a centrifuge will provide, saving the costs of landing and deploying processing equipment on the Moon's surface, and the capability to use the same industry in orbit for processing both asteroidal and lunar material. It seems that beneficiation (discussed in the industrial section) will produce material of high enough quality to launch into orbit. In the early years, waste is generally usable for things ranging from radiation shielding to melt-cast bulk "lunarcrete" walls and light duty structural elements and outfittings. It's likely that we will adopt space-based industrial processes which will be able to convert almost all of the lunar minerals delivered into very useful final products without much waste. Surface manufacturing capabilities for the purpose of building up the lunar base using local materials would be quite worthwhile, e.g., for making steel and glass-ceramic structural items. A mobile solar reflector oven could make the landing/launch pad, road surfaces, dome roofs, etc. Most of the base, in terms of weight, will be produced on-site from local materials, not blasted up from Earth. The lunar base will need a landing/launch pad, a power plant (perhaps a solar cell array for daytime "peak" energy and a small nuclear power plant for nighttime), base construction equipment, a spare parts and maintenance garage, a central control and communications center, housing for the people on-site, and life support systems. Of course, it will also need the mining and beneficiation equipment discussed in other sections. The mining equipment (flail and haulers) and a solar oven would be used in building the initial lunar base before being employed for supplying material for industry in orbital space.

## Now key

### Now is key – the first to mine He3 will be the hegemon

Lasker 06 [John Lasker. “Race to the Moon for Nuclear Fuel”. 12-15-06. http://www.wired.com/science/space/news/2006/12/72276?currentPage=all.]

NASA plans to have a permanent moon base by 2024, but America is not the only nation with plans for a moon base. China, India, the European Space Agency, and at least one Russian corporation, Energia, have visions of building manned lunar bases post-2020. Mining the moon for helium-3 has been discussed widely in space circles and international space conferences. Both China and Russia have stated their nations' interest in helium-3. "We will provide the most reliable report on helium-3 to mankind," Ouyang Ziyuan, the chief scientist of China's lunar program, told a Chinese newspaper. "Whoever first conquers the moon will benefit first." Russian space geologist Erik Galimov told the Russian Izvestia newspaper that NASA's plan to colonize the moon will "enable the U.S. to establish its control of the global energy market 20 years from now and put the rest of the world on its knees as hydrocarbons run out." Schmitt told a Senate committee in 2003 that a return to the moon to stay would be comparable "to the movement of our species out of Africa." The best way to pay for such a long-term mission, he said, would be to mine for lunar helium-3 and process it into a fuel for commercial fusion .

### Now is key – current energy is almost exhausted

D’Souza, Otalvaro, Singh 06 [“HARVESTING HELIUM-3 FROM THE MOON”, Marsha R. D’Souza, Diana M. Otalvaro, Deep Arjun Singh. Februry 17, 2006]

The energy scenario today is governed by uncertainty and fear. Energy demand is expected to increase eight fold by 2020 due to an increase in population and energy requirements, especially on the part of China and India. Alongside an increase in energy demand, oil production is expected to peak within the next decade and, according to conservative estimates, may be exhausted by the middle of the 21st century. Against this reality, alternative energy sources are not only an “alternative,” but rather a necessity. It is with this necessity in mind that exploration of He-3 fusion as a potential energy substitute or a complement to other energy sources is being investigated.

### Now key – if we act now, we can use He3 in 10 years

Moon Daily, 04 [Moon Daily, “Moon Could Meet Earth’s Future Energy Demands: Scientists”, Nov. 26, 2004]

He warned of the exhaustion of fossil fuels such as coal, oil and gas on earth. "By 2050 the whole world will have a major problem. We need to be thinking ahead," Taylor said. "Right now we are not thinking ahead enough. Some of us are. But then the people who make the decisions and put money on the projects are not. They think only about the next elections. "If we set our hearts on the moon and have the money to do it, then we do it pretty fast. However, it could be done well within 10 years if the sources of finance are generated to get this (reactor) going," he said.

## US Action Key

### Only the US has an He3 fusion reactor- International agent CP’s can’t solve

Hedman 06 [Eric R. - chief technology officer of Logic Design Corporation. January 16, 2006. “A fascinating hour with Gerald Kulcinski”]

Professor Kulcinski’s lab is running the only helium-3 fusion reactor in the world. He has an annual research budget that is barely into six figures and allows him to have five graduate research assistants working on the project. Compared to what has been spent on other fusion projects around the world, the team’s accomplishments are impressive. Helium-3 would not require a tokomak reactor like the multibillion-dollar one being developed for the international ITER project. Instead, his design uses an electrostatic field to contain the plasma instead of an electromagnetic field. His current reactor contains spherical plasma roughly ten centimeters in diameter. It can produce a sustained fusion with 200 million reactions per second producing about a milliwatt of power while consuming about a kilowatt of power to run the reactor. It is nuclear power without highly radioactive nuclear waste.

## HE3 Shortage In Status Quo

### Lack of He3 is already a global crisis – laundry list of impact

Lobsenz 10 [George - Editor at The Energy Daily, Editor at Access Intelligence, The Energy Daily, Defense Daily, Energy and Environmental Editor at United Press International. July 1, 2010, “DOE Helium Shortage Hits Nuke Security, Oil and Gas Industry]

**The Energy Department's failure to recognize an impending supply squeeze for helium-3—a nonradioactive gas produced in the agency's nuclear weapons complex—has created a national crisis requiring White House intervention and threatening key U.S. nuclear and homeland security programs, a wide range of medical and scientific research activities and development of U.S. oil and natural gas resources, according to testimony before a House subcommittee.** The testimony at the House Science and Technology Committee's investigations and oversight subcommittee revealed that DOE and other federal officials only fully grasped the situation in 2008. Fast-dwindling helium-3 supplies forced the government last year to begin rationing the gas, which has unique neutron detection and refrigerant capabilities that cannot be provided by other substances in some research and industrial applications. And in a growing snowball of real-world impacts, the sudden helium shortage already has: Disrupted international nonproliferation efforts led by the International Atomic Energy Agency that use helium-based devices to track and safeguard sensitive nuclear materials; Slowed Department of Homeland Security (DHS) and DOE programs to deploy radiation detection machines at airports, seaports and border crossings; Delayed a huge swath of cutting-edge scientific research, ranging from superconductivity to nanotechnology to quantum computing; Curtailed operations at some neutron-scattering facilities overseas, although similar DOE facilities such as the Spallation Neutron Source at Oak Ridge, Tenn., have sufficient helium for planned operations through fiscal year 2014; Jeopardized progress on new lung imaging techniques that promise better treatment methods for respiratory disease; and Forced oil well services companies to scramble for helium-3 devices that are critical to assessing and developing underground oil and gas reservoirs, including the nation's fast-growing shale gas fields. Officials from all those industrial and research sectors, as well as a General Electric official in charge of that company's radiation detector production unit, said they only learned of the helium-3 shortage last year and now are scrambling to develop alternative technologies and, where possible, recycling methods for helium-3.

### He3 is running out

Shea and Morgan ‘010 [http://www.fas.org/sgp/crs/misc/R41419.pdf www.crs.gov Dana A. Shea Specialist in Science and Technology Policy Daniel Morgan Specialist in Science and Technology Policy December 22, 2010]

The world is experiencing a shortage of helium-3, a rare isotope of helium with applications in homeland security, national security, medicine, industry, and science. For many years the supply of helium-3 from the nuclear weapons program outstripped the demand for helium-3. The demand was small enough that a substantial stockpile of helium-3 accumulated. After the terrorist attacks of September 11, 2001, the federal government began deploying neutron detectors at the U.S. border to help secure the nation against smuggled nuclear and radiological material. The deployment of this equipment created new demand for helium-3. Use of the polarized helium-3 medical imaging technique also increased. As a result, the size of the stockpile shrank. After several years of demand exceeding supply, a call for large quantities of helium-3 spurred federal officials to realize that insufficient helium-3 was available to meet the likely future demand.

## HE3 Solves Colonization

### He3 mining makes colonization feasible because it opens up a commercial sector

Coledan 04 [Stefano Coledan – aerospace consultant at Radiotelevisione Italiana “Mining The Moon”, 12-7-04, http://www.popularmechanics.com/science/space/moon-mars/1283056, Popular Mechanics]

A Reason To Return Throughout history, the search for precious resources--from food to minerals to energy--inspired humanity to explore and settle ever-more-remote regions of our planet. I believe that helium-3 could be the resource that makes the settlement of our moon both feasible and desirable. Although quantities sufficient for research exist, no commercial supplies of helium-3 are present on Earth. If they were, we probably would be using them to produce electricity today. The more we learn about building fusion reactors, the more desirable a helium-3-fueled reactor becomes. Researchers have tried several approaches to harnessing the awesome power of hydrogen fusion to generate electricity. The stumbling block is finding a way to achieve the temperatures required to maintain a fusion reaction. All materials known to exist melt at these surface-of-the-sun temperatures. For this reason, the reaction can take place only within a magnetic containment field, a sort of electromagnetic Thermos bottle. Initially, scientists believed they could achieve fusion using deuterium, an isotope of hydrogen found in seawater. They soon discovered that sustaining the temperatures and pressures needed to maintain the so-called deuterium-deuterium fusion reaction for days on end exceeded the limits of the magnetic containment technology. Substituting helium-3 for tritium allows the use of electrostatic confinement, rather than needing magnets, and greatly reduces the complexity of fusion reactors as well as eliminates the production of high-level radioactive waste. These differences will make fusion a practical energy option for the first time. It is not a lack of engineering skill that prevents us from using helium-3 to meet our energy needs, but a lack of the isotope itself. Vast quantities of helium originate in the sun, a small part of which is helium-3, rather than the more common helium-4. Both types of helium are transformed as they travel toward Earth as part of the solar wind. The precious isotope never arrives because Earth's magnetic field pushes it away. Fortunately, the conditions that make helium-3 rare on Earth are absent on the moon, where it has accumulated on the surface and been mixed with the debris layer of dust and rock, or regolith, by constant meteor strikes. And there it waits for the taking. An aggressive program to mine helium-3 from the surface of the moon would not only represent an economically practical justification for permanent human settlements; it could yield enormous benefits back on Earth.

## HE3 Solves Resource Wars/Climate Change

### Clean energy solves poverty and climate change

Schell 11 [Bernhard- Global Geopolitics & Political Economy. Jan. 19, 2011. “Combating Poverty with Clean Energy”]

Addressing the Fourth World Future Energy Summit in Abu Dhabi, United Arab Emirates, on January 17, Ban said: "Our challenge is transformation. **We need a global clean energy revolution — a revolution that makes energy available and affordable for all." This, he added, is essential for minimizing climate risks, for reducing poverty and improving global health, for empowering women** and meeting the Millennium Development Goals (eight anti-poverty targets with a 2015 deadline), for global economic growth, peace and security, and the health of the planet." Ban said that the decisions taken now will have far-reaching consequences. The prevailing fossil fuel-based economy is contributing to climate change — and global energy needs are growing rapidly. Several studies point out that in twenty years, energy consumption will rise by 40 per cent, mostly in developing countries, where 1.6 billion people still lack access to electricity, and where 3 billion people rely on traditional biomass fuels for cooking, heating, and other basic household needs. The Secretary-General’s Advisory Group on Energy and Climate Change, set up in 2009, has recommended two "bold but achievable" targets for 2030 — universal access to modern energy sources and a 40 per cent increase in energy efficiency. "To achieve this, we must invest in the intellectual capital that will create new, green technologies. We need to increase private and public spending on research and development, and Governments need to create the right incentives," said Ban. "So let us pledge to invest wisely. We need to get our priorities right. People everywhere should be able to enjoy the health, educational and social benefits that modern energy sources offer," he said, adding: "We are on the brink of an exciting, sustainable future. Clean energy for all." Ban’s call could not have come at a more opportune point in time. In December 2010, the UN General Assembly proclaimed 2012 as the ‘International Year for Sustainable Energy for All’ with the aim of promoting new and renewable energy technologies, including measures to improve access to such technologies.

### Climate change causes resource wars, resulting in extinction

Klare 6 (Michael T. Klare Ph.D, Professor of peace and world security studies at Hampshire University, “The Coming Resource Wars” http://www.alternet.org/story/33243/the\_coming\_resource\_wars, 3/10/2006)

It's official: the era of resource wars is upon us. In a major London address, British Defense Secretary John Reid warned that global climate change and dwindling natural resources are combining to increase the likelihood of violent conflict over land, water and energy. Climate change, he indicated, "will make scarce resources, clean water, viable agricultural land even scarcer" -- and this will "make the emergence of violent conflict more rather than less likely." Although not unprecedented, Reid's prediction of an upsurge in resource conflict is significant both because of his senior rank and the vehemence of his remarks. "The blunt truth is that the lack of water and agricultural land is a significant contributory factor to the tragic conflict we see unfolding in Darfur," he declared. "We should see this as a warning sign." Resource conflicts of this type are most likely to arise in the developing world, Reid indicated, but the more advanced and affluent countries are not likely to be spared the damaging and destabilizing effects of global climate change. With sea levels rising, water and energy becoming increasingly scarce and prime agricultural lands turning into deserts, internecine warfare over access to vital resources will become a global phenomenon. Reid's speech, delivered at the prestigious Chatham House in London (Britain's equivalent of the Council on Foreign Relations), is but the most recent expression of a growing trend in strategic circles to view environmental and resource effects -- rather than political orientation and ideology -- as the most potent source of armed conflict in the decades to come. **With the world population rising, global consumption rates soaring, energy supplies rapidly disappearing and climate change eradicating valuable farmland, the stage is being set for persistent and worldwide struggles over vital resources.** Religious and political strife will not disappear in this scenario, but rather will be channeled into contests over valuable sources of water, food and energy. Prior to Reid's address, the most significant expression of this outlook was a report prepared for the U.S. Department of Defense by a California-based consulting firm in October 2003. Entitled "An Abrupt Climate Change Scenario and Its Implications for United States National Security," the report warned that global climate change is more likely to result in sudden, cataclysmic environmental events than a gradual (and therefore manageable) rise in average temperatures. Such events could include a substantial increase in global sea levels, intense storms and hurricanes and continent-wide "dust bowl" effects. This would trigger pitched battles between the survivors of these effects for access to food, water, habitable land and energy supplies. "Violence and disruption stemming from the stresses created by abrupt changes in the climate pose a different type of threat to national security than we are accustomed to today," the 2003 report noted. "Military confrontation may be triggered by a desperate need for natural resources such as energy, food and water rather than by conflicts over ideology, religion or national honor." Until now, this mode of analysis has failed to command the attention of top American and British policymakers. For the most part, they insist that ideological and religious differences -- notably, the clash between values of tolerance and democracy on one hand and extremist forms of Islam on the other -- remain the main drivers of international conflict. But Reid's speech at Chatham House suggests that a major shift in strategic thinking may be under way. Environmental perils may soon dominate the world security agenda. This shift is due in part to the growing weight of evidence pointing to a significant human role in altering the planet's basic climate systems. Recent studies showing the rapid shrinkage of the polar ice caps, the accelerated melting of North American glaciers, the increased frequency of severe hurricanes and a number of other such effects all suggest that dramatic and potentially harmful changes to the global climate have begun to occur. **More importantly, they conclude that human behavior -- most importantly, the burning of fossil fuels in factories, power plants, and motor vehicles -- is the most likely cause of these changes**. This assessment may not have yet penetrated the White House and other bastions of head-in-the-sand thinking, but it is clearly gaining ground among scientists and thoughtful analysts around the world. For the most part, public discussion of global climate change has tended to describe its effects as an environmental problem -- as a threat to safe water, arable soil, temperate forests, certain species and so on. And, of course, climate change is a potent threat to the environment; in fact, the greatest threat imaginable. But viewing climate change as an environmental problem fails to do justice to the magnitude of the peril it poses. As Reid's speech and the 2003 Pentagon study make clear, the greatest danger posed by global climate change is not the degradation of ecosystems per se, but rather the disintegration of entire human societies, producing wholesale starvation, mass migrations and recurring conflict over resources. "As famine, disease, and weather-related disasters strike due to abrupt climate change," the Pentagon report notes, "many countries' needs will exceed their carrying capacity" -- that is, their ability to provide the minimum requirements for human survival. This "will create a sense of desperation, which is likely to lead to offensive aggression" against countries with a greater stock of vital resources. "Imagine eastern European countries, struggling to feed their populations with a falling supply of food, water, and energy, eyeing Russia, whose population is already in decline, for access to its grain, minerals, and energy supply." Similar scenarios will be replicated all across the planet, as those without the means to survival invade or migrate to those with greater abundance -- producing endless struggles between resource "haves" and "have-nots." It is this prospect, more than anything, that worries John Reid. In particular, he expressed concern over the inadequate capacity of poor and unstable countries to cope with the effects of climate change, and the resulting risk of state collapse, civil war and mass migration. "More than 300 million people in Africa currently lack access to safe water," he observed, and "climate change will worsen this dire situation" -- provoking more wars like Darfur. And even if these social disasters will occur primarily in the developing world, the wealthier countries will also be caught up in them, whether by participating in peacekeeping and humanitarian aid operations, by fending off unwanted migrants or by fighting for access to overseas supplies of food, oil, and minerals. When reading of these nightmarish scenarios, it is easy to conjure up images of desperate, starving people killing one another with knives, staves and clubs -- as was certainly often the case in the past, and could easily prove to be so again. But **these scenarios also envision the use of more deadly weapons. "In this world of warring states," the 2003 Pentagon report predicted, "nuclear arms proliferation is inevitable." As oil and natural gas disappears, more and more countries will rely on nuclear power to meet their energy needs -- and this "will accelerate nuclear proliferation as countries develop enrichment and reprocessing capabilities to ensure their national security."** Although speculative, these reports make one thing clear: when thinking about the calamitous effects of global climate change, we must emphasize its social and political consequences as much as its purely environmental effects. Drought, flooding and storms can kill us, and surely will -- but so will wars among the survivors of these catastrophes over what remains of food, water and shelter. As Reid's comments indicate, no society, however affluent, will escape involvement in these forms of conflict.

### Lack of He3 destroys the oil and gas industries because their tools need He3—magnifies risk of a resource war

Brown 10 [October 2010 “Lack of Helium-3 Sounding Alarms”, David – explorer correspondent. http://www.aapg.org/explorer/2010/10oct/helium1010.cfm]

A Critical Need Project areas for Inter-American include New Mexico, Utah, Colorado and Kansas. Most helium-rich gas in the United States is found in the mid-continent and southwestern states. Target helium-rich fields indicate an abundance of uranium and/or thorium in basement rock, since their radioactive decay produces helium, and the presence of heavy, deep-seated faulting. The very small amount of helium-3 found with helium-4 can be separated out – at considerable cost and in limited quantity. “It’s in the parts per million. On average in natural gas deposits it’s 0.2 parts per million of the helium-4 content,” Sears said. Because of the relative abundance of primordial helium-3 in the mantle, geochemists use the helium-3/helium-4 ratio as a tracer to identify the presence of a mantle component in petroleum systems, he noted. Sears said Inter-American uses the helium-3 ratio to help define helium-4 potential. Analysis of some gas has found an anomalously high ratio, especially in New Mexico. Helium-3 extraction plants could be built near helium-rich gas fields, but the estimated cost is in the tens of millions of dollars per plant. Yet the helium scarcity is so critical that all options are on the table. “At this point in the helium-3 crisis, every little bit helps,” Sears said. “**My concern is that the oil and gas industry will be squeezed out entirely. It could have a horrible effect on the industry, because all neutron tools use helium-3**.” Thanks in part to nuclear disarmament, the United States once had a substantial supply of helium-3. Tritium (hydrogen-3) used in nuclear weapons was recovered as the warheads were dismantled. Tritium produces helium-3 as it decays. A declining amount of recovered tritium and a surge in demand in the years following the 9/11 attacks caused the stockpile to dwindle. Because the half-life of tritium is over 12 years, Sears said “even if dedicated tritium production began today, which is cost prohibitive, it would be years before you get any meaningful amount of helium-3.”

### He3 helps find petroleum and medicine

Brown 10 [October 2010 “Lack of Helium-3 Sounding Alarms”, David – explorer correspondent. http://www.aapg.org/explorer/2010/10oct/helium1010.cfm]

A crucial shortage in the world’s supply of helium-3 could alter the use of an important tool for the oil and gas industry. And that’s just one problem. The rare helium isotope also is used in applications ranging from cryogenic studies to lung imaging in medicine. Far and away the largest consumer of helium-3 in the United States recently has been the Department of Homeland Security, which uses it in radiation sensors. Think of trying to stop someone who’s smuggling a small amount of plutonium for a nuclear weapon. “Crisis really is the best word for this situation,” said AAPG member Bo Sears, vice president of Inter-American Corp. in Dallas, one of the industry’s small number of helium explorers. For oil and gas companies, helium-3 is an essential component in neutron logging tools used worldwide. “Helium-3 is used in neutron detectors for neutron porosity tools, which are one of the key instruments used to locate hydrocarbons, estimate petroleum reserves and make production decisions,” said Brad Roscoe, scientific advise and nuclear program manager at Schlumberger-Doll Research in Cambridge, Mass. “The neutron device is particularly used to establish the rock and fluid parameters which help determine these properties,” he added. Downhole neutron tools measure the amount of hydrogen in rock pores as an indication of porosity. “Since the neutron porosity measurement is a key measurement,” Roscoe said, “it is run in almost every oil and gas well in the world.”

### The plethora of He3 spurred lots of competition between the US, Russia, and China

Kazen 10 [October 03, 2010 Casey Kazan via newscientist.com Daily galaxy editorial staff.

http://www.dailygalaxy.com/my\_weblog/2010/10/china-launches-second-moon-mission-is-mining-helium-3-an-ultimate-goal.html]

In 2007, shortly after Russia claimed a vast portion of the Arctic sea floor, accelerating an international race for the natural resources as global warming opens polar access, China announced plans to map "every inch" of the surface of the Moon and exploit the vast quantities of Helium-3 thought to lie buried in lunar rocks as part of its ambitious space-exploration program

Ouyang Ziyuan, head of the first phase of lunar exploration, was quoted on government-sanctioned news site ChinaNews.com describing plans to collect three dimensional images of the Moon for future mining of Helium 3: "There are altogether 15 tons of helium-3 on Earth, while on the Moon, the total amount of Helium-3 can reach one to five million tons."

## HE3 Solves Prolif

### He3 is key to detecting smuggled nuclear weapons – it’s in high demand

Wald 5/28 [Matthew L. - Sr. Executive in the Emerging Technology Industry, “Agencies’ Lack of Coordination Hindered Supply of Crucial Gas, Report Says”, May 28, 2011]

WASHINGTON — The United States is running out of a rare gas that is crucial for detecting smuggled nuclear weapons materials because one arm of the Energy Department was selling the gas six times as fast as another arm could accumulate it, and the two sides failed to communicate for years, according to a new Congressional audit. The gas, helium-3, is a byproduct of the nuclear weapons program, but as the number of nuclear weapons has declined, so has the supply of the gas. Yet, as the supply was shrinking, the government was investing more than $200 million to develop detection technology that required helium-3. As a result, government scientists and contractors are now racing to find or develop a new detection technology. According to the Government Accountability Office report, the Energy Department’s National Nuclear Security Administration, which gathers the gas from old nuclear weapons, never told the department’s Isotope Program about the slowing rate of helium-3 production. That is in part because it was secret information that could be used to calculate the size of weapon stockpiles. For its part, the Isotope Program calculated demand for the gas not in a scientific way but instead on the basis of how many commercial companies called to inquire each year about helium-3 supplies. Representative Donna Edwards of Maryland characterized the situation as “gross mismanagement.” As the ranking Democrat on the House science committee’s Subcommittee on Investigations and Oversight, Ms. Edwards was one of the members of Congress who asked the accountability office to study the problem after it was detected in 2008. “With so much riding on helium-3, it is shocking to learn that the department’s forecast for demand is based simply on a telephone log tracking those who called asking about the availability of helium-3,” she said. The report is to be released in the coming week by Ms. Edwards and Representative Brad Miller of North Carolina, the ranking Democrat on the science committee’s Subcommittee on Energy and Environment. Energy Department officials said that since the discrepancy was discovered, they had moved the Isotope Program under the umbrella of the agency’s science division and had worked harder to forecast supply and demand for various materials. But they did acknowledge the bureaucratic fumble; the Isotope Program is responsible for the supply of materials it produces, but not for the supply of those it distributes but are produced by other parts of the Energy Department. The helium-3 is considered a “legacy material,” something that exists only because of past activities. Ms. Edwards pointed out that helium-3 was also used in the oil and gas industry and in research. Because of divided responsibilities and a sudden new source of demand, “all of a sudden we realized we had this additional factor and had to come up with something different,” Steven Aoki, the deputy under secretary of energy for counterterrorism, said in a telephone interview. He said he was optimistic that new technologies using more readily available materials would be ready in a year or two… There are other ways to build equipment to detect smuggled nuclear material, but helium-3 is nontoxic and nonradioactive and is considered more accurate. The neutrons given off by plutonium and uranium are hard to detect, but when helium-3 is hit by a stray neutron, it creates a charged particle, which is readily detected and measured.

### He3 can prevent nuclear prolif and detect hidden bombs

Hedman 06 [Eric R. - chief technology officer of Logic Design Corporation. January 16, 2006. “A fascinating hour with Gerald Kulcinski”]

One of Professor Kulcinski’s graduate assistants is working on a solid-state device to capture the protons and convert the energy in them directly to electricity in a process not too different than a solar cell. We also discussed the potential for small helium-3 reactors producing the isotope oxygen-15 for medical imaging (PET scans), and as a production source for neutrons for detection of explosive or fissionable materials (delayed neutron emission) to prevent nuclear proliferation. Relatively portable neutron sources can be used to detect landmines and bombs in suitcases.

## HE3 Solves Fusion

### Fusion solves a laundry list of impacts

Bilder 09 [Fordham International Law Journal Vol. 33, Issue 2, 2009, Article 1, “A Legal Regime for the Mining of Helium-3 on the Moon: U.S. Policy Options”, Richard B. Bilder – prof. @ University of Wisconsin]

Fusion energy could significantly reduce the world's heavy dependence on fossil fuels, which are associated with environmental pollution, greenhouse gas emissions, and global warming-not to mention their rising price and role in recurrent geopolitical and economic tensions. Fusion energy could also provide a safer alternative to many countries' growing reliance on energy generated from nuclear fission reactors, which hold the potential dangers of nuclear accidents, terrorism, weapons proliferation, and radioactive waste disposal. Moreover, in contrast to the prospect of depletion of terrestrial fossil fuels, it is estimated that there is sufficient He-3 present on the Moon to meet humanity's rapidly growing energy needs for many centuries to come. 6 Thus, despite the problematic future of He-3-based fusion energy, it is not surprising that the United States and other major powers are beginning to position themselves to ensure their future access to lunar He-3 resources.

## HE3 Solves Laundry List

### He3 mining has a laundry list of benefits – short term and long term

D’Souza, Otalvaro, Singh 06 [“HARVESTING HELIUM-3 FROM THE MOON”, Marsha R. D’Souza, Diana M. Otalvaro, Deep Arjun Singh. Februry 17, 2006]

The United States leads the research in He-3. In 2004, President Bush released his new vision of space exploration. He wants to complete the International Space Station by the year 2010. The completion of this project will greatly increase the working research on the lunar mining of He-3 as the astronauts can experiment on different techniques to extract He-3 from the Moon’s regolith. The International Space stations could be used a trade center for the distribution of He-3 for world wide distribution. Another goal of the current White House administration is that NASA returns to the Moon by 2015 and to have a permanent living settlement for astronauts by 2020. President Bush has allocated 12 million dollars to the Moon Development Initiative. This initiative would help tremendously in the progress in the He-3 research if a permanent colony is established on the Moon (Hurtack, 2004). The developed world would no longer have to depend on the Middle East , where the most of the world’s fossil fuel reserves are located, for its energy supply. American scientists have already declared that the Moon could be the Persian Gulf of the present century. Two liters of He-3 would do the work of more than 1,000 tons of coal (Chowdhuri, 2004). He-3 also has long term and short term benefits for society. In the near term applications, it can help in medical research. A useful product of He-3 fusion reactions is the production of isotopes that are very useful in the biomedical field. Positron Emission Tomography (PET) is one such field. This process uses the isotopes from He-3 fusion reaction like He-4 in its working. He-4 has a much longer half-life and it can be stored for a much longer periods of time compared to other isotopes. By using He-3 isotopes we can reduce the radioactive exposure to patients compared to the regular isotopes that are used in PET that emit radioactive waves (Hurtack, 2004). It can also be used for environmental restoration, detection of chemical and radioactive wastes, cancer therapy and defense. For intermediate term applications, it can be used for the destruction of toxic fissile materials, to harness space power and to supply energy to remote energy stations. In the long term it can have applications in propulsion technology, hydrogen production, synthetic fuel applications, base load electrical power plants and small electrical power plants (Kulcinski, 2001). The advantage of initially using He-3 fusion for non-energy applications is that the cost base is different for specialized applications and He-3 can be competitive in the short run. This would then open the ground for further cost reduction and prepare He-3 fusion to enter the energy marketplace at competitive prices.

### He3 solves security, science, and nuclear weapon detection

Shea and Morgan ‘010 [http://www.fas.org/sgp/crs/misc/R41419.pdf www.crs.gov Dana A. Shea Specialist in Science and Technology Policy Daniel Morgan Specialist in Science and Technology Policy December 22, 2010]

The world is experiencing a shortage of helium-3, a rare isotope of helium with applications in homeland security, national security, medicine, industry, and science. For many years the supply of helium-3 from the nuclear weapons program outstripped the demand for helium-3. The demand was small enough that a substantial stockpile of helium-3 accumulated. After the terrorist attacks of September 11, 2001, the federal government began deploying neutron detectors at the U.S. border to help secure the nation against smuggled nuclear and radiological material. The deployment of this equipment created new demand for helium-3. Use of the polarized helium-3 medical imaging technique also increased. As a result, the size of the stockpile shrank. After several years of demand exceeding supply, a call for large quantities of helium-3 spurred federal officials to realize that insufficient helium-3 was available to meet the likely future demand.

## HE3 Solves Economy

### Colonizing the moon solves for poverty through clean energy

Hedman 06 [Eric R. - chief technology officer of Logic Design Corporation. January 16, 2006. “A fascinating hour with Gerald Kulcinski”]

Imagine a world thirty years from now. NASA has led the way to returning humans to the Moon and is in the final steps of preparing for human exploration and settlement of Mars. On Earth our environment is cleaner with reliable fusion reactors steadily replacing coal-fired plants and fission reactors. The fuel for these reactors is being mined from the surface of the Moon relegating the mercury, radium and carbon dioxide-laced exhaust from coal-fired plants to “the ash heap of history”. The growth of highly radioactive waste from fission power plants is following coal into history. Dependency on highly volatile regions of our planet for energy supplies is steadily diminishing. Clean power is allowing economic development of the world to continue, lifting a higher and higher percentage of the population out of poverty. Is this a possible future for our country and the planet? Professor Kulcinski and his small team of researchers just might have the answer and NASA might provide access to the key enabling resource.

### He3 is a clean energy source – now is key

Layton, no date [Julia – Discovery Channel – Energy 365. “How can the moon give us clean energy?” http://dsc.discovery.com/energy/energy-power/clean-energy-from-the-moon.html]

A few decades ago, the pursuit of clean energy was "green." Now, it's a necessity. Not only is our power consumption propelling the human race toward a hot, watery, lonely end, but clean energy tends also to be renewable. And renewable energy is the name of the game when current primary power sources are dirty, finite or both. In short, Earth is in an energy crisis, and some experts are looking beyond terrestrial elements for a long-term solution. Some scientists are turning to the moon. Moon energy is not an entirely new concept. One power source already in operation relies on the moon's gravitational pull to spin its generators. Tidal power plants arranged like hydroelectric dams have been around for decades. They trap water during high tide and then, during low tide, release it through turbines. According to Energy Quest, one plant in France that opened in 1966 still powers hundreds of thousands of homes. Tidal undercurrents can also spin freestanding "tidal turbines" placed strategically on the sea floor. Still in testing stages, one turbine in Norway's Kvalsund Channel began powering 35 homes in 2003, and a project at the bottom of New York's East River is planned to provide thousands of homes with electricity in coming years. Moon-as-energy-source, though, gets a whole lot more sci-fi than that. The helium-3 approach to clean energy, on the books since the mid-1980s, isn't even close to viability, but its promise is hard to discount. The He3 ions in the moon's upper crust — about 1 million metric tons, according to proponents — could keep U.S. lights on for about a thousand years, according to Energy Bulletin. All it would take is some nuclear fusion to release the potential. Oh, and a mass-scale mining project on the lunar surface. The possibilities are dramatic. The whole thing starts with a fusion reactor, which isn't yet a viable technology. The reactor would combine helium-3 ions to produce helium-4 (the regular stuff found on Earth) and energized protons. According to Energy Bulletin, the process would release no greenhouse gasses. It would, however, produce a whole lot of energy. According to Artemis, the protons produced by a fusion reactor fed with the moon's available He3 could produce 10 times more power than the combustion of every bit of fossil fuel found on Earth. Here's the rub, though. That He3 isn't exactly "available." Many challenges face the potential lunar energy source. First, as of 2010, the United States, for one, isn't going back to the moon to establish a permanent colony. That most likely dampens, or at least postpones, any plans to develop an He3 mining project. What's more, some experts say it's actually pretty difficult to mine He3. It would require heating lunar soil to extreme temperatures that may simply be prohibitive, as far as lunar-mining goes. And then there's the fact that a large-scale fusion reactor is at least half a century away. Still, the theory persists. He3 could provide more energy, and more-renewable energy, than current power sources. And all that energy would be so clean, energy credits would be a thing of the past. At least once He3 replaced rocket fuel, anyway.

### He3 spurs the collaboration of the government and private industry

Bilder 09 [Fordham International Law Journal Vol. 33, Issue 2, 2009, Article 1, “A Legal Regime for the Mining of Helium-3 on the Moon: U.S. Policy Options”, Richard B. Bilder – prof. @ University of Wisconsin]

Finally, the economic viability of He-3-based fusion power will, of course, depend on its eventual production cost relative to alternative sources of energy such as fossil fuel or other conventional sources of energy, energy produced by nuclear fission reactors, or other forms of fusion energy-all figures difficult to accurately predict at this time. Proponents of He-3 based fusion energy argue that, notwithstanding the substantial costs involved in developing He-3 fusion reactors, establishing a lunar mining operation, and transporting He-3 back to Earth, He-3-based fusion power will eventually be more than competitive with the cost of other types of energy resources and provide more than sufficient incentive for the participation of both government and private enterprise. 36 But other commentators are more skeptical, doubting both the technical feasibility of such a complex and challenging development and the likelihood of He-3-based fusion power ever competing successfully with more traditional Earth-based energy systems. 37 Suffice it to say, major space powers currently consider the potential of He-3-based fusion energy sufficiently promising as to warrant their serious interest and to furnish at least an additional rationale for their commitment to programs to establish national stations on the Moon

### He3 generates more jobs in the oil industry

Kulcinski 96 [Gerald L - Associate Dean for Research Grainger Professor of Nuclear Engineering Director, Fusion Technology Institute] [learning.hccs.edu/faculty/kristine.ervin/engl1302/resources/...of.../file]

Some people think that by using Helium 3 will ruin the economy of the country and the world, perhaps they are individuals that have no idea of this subject or even care to know that scientists have been doing studies on this gas for several years. Its existence was first proposed by the Australian nuclear physicist Mark Oliphant while working at Cambridge University's Cavendish Laboratory. Helium 3 is one of the best industrial gases there is out there, it consist on one neutron and two protons, it is rarely found on earth but it is very common to be found in abundance on the moon. Helium 3 is proposed as a future generation of fuel but not only for cars and planes but also on any type of machinery currently using gasoline, which is mentioned in details on the first category during the body part of the reading. Over the past ten years helium 3 is becoming more attractive to big corporations due to increase in oil prices and also because we are starting to run out of oil; therefore they are investing money and time on doing several research’s and studies on helium 3. Eventually, this gas will generate more jobs and also will keep people employed by their existing employers.

### The abundance of He3 on the moon will provide mass amounts of money and energy

Shimkus 11 (John Shimkus, Expert in Global Mining at Energy Digital, “Mining Helium-3 will Transform the Dark Side of the Moon”, http://www.energydigital.com/global\_mining/mining-helium-3-will-transform-dark-side-of-the-moon, 5/9/2011)

Most people are unaware that our Moon holds countless resources. Some are familiar: titanium, platinum, silicon, ammonia, mercury, and even water (yes, H20 has been confirmed to be present on the moon). But a more elusive substance, which is a rarity here on Earth, is also found on the Moon: helium-3. Helium-3 is a non-radioactive hydrogen isotope with one neutron and two protons. It is carried through space via the Sun’s solar winds, but burns up as it enters Earth’s atmosphere, making it almost non-existent here on our planet. However, an abundance of helium-3 has built up on the Moon’s surface over the millennia as confirmed in soil samples collected by the Apollo 17 lunar mission, and it is just waiting to be mined. Why you ask? Because, helium-3 can fuel non-radioactive nuclear fusion reactions to produce safe, clean, abundant energy, and can completely transform our energy future. Helium-3 nuclear fusion reactions release non-radioactive protons that can be harnessed to create electricity directly. This type of nuclear fusion is safer and far more efficient than the nuclear fission reactions used in nuclear plants today, which use heat to run steam turbines, losing energy in the conversion process and creating radioactive waste as a byproduct. Projections estimate that on a commercial basis helium-3 would be worth around $40,000 per ounce. Roughly 100 tons of Helium-3 could power the entire population of Earth for a year and scientists estimate that the Moon could contain approximately 1 million tons—10,000 years worth of energy. But is mining the Moon realistic, and who would spearhead such a risky endeavor? Google announced the “Google Lunar X PRIZE” competition in 2007, in which the Internet giant challenged privately funded spaceflight teams from across the globe to send a robot to the moon’s surface. The first successful team will win $30 million in prizes. As of February 2011, 29 teams from various nations are officially competing for the prize, and several will be launching within the next two years. The US state of Florida is also offering a $2 million prize to the first private spaceflight launched from its soil. NASA is even willing to pay $10 million or more for data collected from private lunar missions. Caterpillar—a top name in mining machinery and equipment—has invested in Carnegie Mellon University’s Astrobotic Technology, a company vying for the Google Lunar X PRIZE. Already having experience in automated machinery, Caterpillar will use the partnership with Astrobotic to propel its own lunar program. Caterpillar Automation Systems Manager Eric Reiners says,“Caterpillar makes sustainable progress possible by enabling infrastructure development and resource utilization on every continent on Earth. It only makes sense we would be involved in expanding our efforts to the 8th continent: the Moon.” Richard Branson—the man, the myth, the legend—has started up Virgin Galactic. With his own private fleet of spaceships and a spaceport in New Mexico (USA), Branson is already booking spaceflights for those who can afford the $200,000 ticket price. Initial flights will be sub-orbital, with the goal of eventually setting up a lunar resort, in which the elite can take a vacation to the Moon. While no official statements have confirmed Branson’s intentions to mine the Moon, media contacts from Virgin Galactic have hinted that it is not out of the realm of possibility. The governments of Russia, China and India have all made public comments on exploiting the Moon’s resources, and the Russian space company RSC Energia has proposed a permanent lunar base to be completed by 2025 as a hub for helium-3 mining operations. According to the Outer Space Treaty of 1967, Moon mining does not seem to violate any international agreements. However, there is debate over who would own the rights to the materials mined.

### He3’s properties make it extremely useful in many industries

Shea and Morgan ‘010 [http://www.fas.org/sgp/crs/misc/R41419.pdf www.crs.gov Dana A. Shea Specialist in Science and Technology Policy Daniel Morgan Specialist in Science and Technology Policy December 22, 2010]

Helium-3 has properties that currently make it in high demand. Like all helium, helium-3 isnontoxic. Helium-3 also absorbs neutrons. This property has resulted in its widespread use forneutron detection. Neutron detection is a key component of applications in national and homelandsecurity, industry, and science. For example, the federal government uses radiation portalmonitors and other neutron detectors at the U.S. border to prevent smuggling of nuclear andradiological material, and the oil and gas industry uses neutron detectors for well logging.3Another property that has increased demand for helium-3 in recent years is the ability to polarizeits nucleus. For example, magnetic resonance imaging (MRI) can take advantage of this propertyto enable real-time visualization of a patient’s lung capacity and capability. Finally, helium-3 has unique cryogenic properties. Low-temperature physicists use a mixture of helium-3 and helium-4 to achieve temperatures just a few thousandths of a degree above absolute zero (millikelvins). At temperatures below 2.5 millikelvin, helium-3 becomes a superfluid.

## HE3 Solves Medical Imaging

### He3 is key to medical imaging

Cho 09 [“Helium-3 Shortage Could Put Freeze On Low-Temperature Research”November 6, 2009, Vol 326, The American Association for the Advancement of Science. Adrian Cho]

Heiblum has fallen victim to a severe shortage of helium-3, the lighter isotope of the most inert element. Two weeks ago, he also lost about 15 liters of helium-3 from an existing fridge when an electronic valve failed. When Heiblum tried to buy more, a supplier in the United States turned him away and a Europe an company wanted an un a f fordable €1300 per liter , up from €100 just 2 years ago. “ If this continues, then low temperature physics will just disappear,” Heiblum says. No end to the shortage is in sight, however. In recent years the supply of helium-3 has dwindled, while the demand has skyrocketed — especially since 2002, when the U.S. Departme n t o f Home l a n d S e c u r i t y (DHS ) a n d Department of Energy (DOE) began deploying thousands of helium-3–filled neutron detectors to help prevent the smuggling of plutonium and other radioactive materials into the country. In the short term, demand will likely top 65,000 liters per year, while supply will hover between 10,000 and 20,000 liters per year, according to a DOE study. The shortfall threatens several research fields, and DOE, the major supplier, is releasing the gas only to researchers with U.S. funding. Helium-3 also fills neutron detectors at large neutron-scattering facilities used to probe materials, such as the one at the new Japan Proton Accelerator Research Complex ( J - PA R C ) i n To k a i . T h e p r o j e c t e d n e e d for that application alone exceeds 100,000 l i t e r s o v e r t h e n e x t 6 y e a r s . J - PA R C researchers need 16,000 liters of helium-3 to complete detectors for 15 of 23 beamlines, says J-PARC’s Masatoshi Arai: “If we cannot get helium-3 and detectors, … [then] we cannot perform sufficiently good experiments f rom the neut ron f a c i l i ty a t J -PARC , f o r which we spent $1.5 billion for construction.” Low- temperature physicists say theyneed between 2500 and 4500 liters of helium-3 per year, primarily to fill new dilution refrigerators. Helium is the only substance that remains liquid at absolute zero, and only by pumping the vapor off a liquefied mixture of helium-3 and heavier helium-4 can physicists achieve steady temperatures below 0.8 kelvin, says William Halperin, a physicist at Northwestern University in Evanston, Illinois. “**If we lose our helium-3 [supply], we’re totally screwed,”** s a y s Halperin, who notes that work on quantum computing and nanoscience often requires extremely low temperatures. Helium-3 also serves a role in medical imaging. When inhaled by a patient, it allows researchers to image the lungs with an MRI.

# Aerospace Advantage

## 1AC – Aerospace Advantage

### US Aerospace is on the brink of collapse - Obama’s cancelation of Constellation will cause workers to work for another nation

Wall, 7/13 [Mike Wall, columnist for space exploration, July 13, 2011, “Congress Grills NASA Chief Over Next Big Rocket Design,” <http://www.foxnews.com/scitech/2011/07/13/congress-grills-nasa-chief-over-next-big-rocket-design/#ixzz1S0zui2ex>, DA: 7/13/11]//RS

NASA's new deep space plan Last year Obama laid out a deep space exploration plan for the National Aeronautics and Space Administration: Get an astronaut to an asteroid by 2025, then to Mars by the mid-2030s. The Space Launch System is a key part of this plan, as is a crewed deep space vehicle. The basic architecture for both of these components was supposed to be decided by January. In May, NASA announced that the spaceship, which it calls the Multi-Purpose Crew Vehicle, would be based heavily on the Orion spacecraft. NASA originally developed Orion for President George W. Bush's moon-oriented Constellation program; Obama canceled the program last year. But the space agency still hasn't officially announced the architecture for the new rocket that will launch the crew vehicle to deep space. NASA maintained at various times that a decision was coming in the spring, then in June, then in early July. NASA associate administrator Lori Garver said last week the agency hopes to make an announcement by late summer. The repeated delays have not gone over well with many members of Congress, who want NASA to show it has solid plans for continuing the United States' global leadership in human spaceflight following the retirement of the space shuttle program. The iconic program will wind down after 30 years of operation when the shuttle Atlantis touches down July 21. If NASA doesn't demonstrate a clear path forward, some Congress members said, U.S. leadership is threatened. Many people in the aerospace industry, for example, might move on, fearing that jobs will dry up for the long haul. "I firmly believe that if we lose this talent, it won't be just to another state or another agency," said Rep. Eddie Bernice Johnson (D-Texas). "It'll be to another country."

### Now is key- ½ of the aerospace industry is set to retire by 2015 with the cancelation of NASA’s space shuttle program Michels, 7/13 [Jennifer Michels, journalist for Aviation Week, July 13, 2011, U.S. Could Lose Competitive Edge Without Investments,” Aviation Week, <http://www.aviationweek.com/aw/generic/story_generic.jsp?channel=aviationdaily&id=news/avd/2011/07/14/03.xml&headline=U.S.%20Could%20Lose%20Competitive%20Edge%20Without%20Investments>, DA 7/14/11]//RS

If the U.S. does not invest in aerospace and technology soon—not to mention find a way to attract more students into engineering—it risks losing its competitive edge as the leading country for aviation and aerospace in the world, says Jim Albaugh, president and CEO of Boeing Commercial Airplanes. Noting that **half of Boeing’s engineers**, **and those of other companies, could opt to retire by 2015**, he noted that more needs to be done within the U.S. to bolster engineering schools. Boeing has a partnership in Russia to attract engineers, and Albaugh says it is looking at several other countries as well. With the space shuttle program now at a standstill following the retirement of the Atlantis space shuttle, those engineers could be “lost forever” to retirement or other industries, he says. On the commercial airline side, the U.S. and Europe have led the way in innovation, but going forward, if investments are not made, Brazil, Canada, China and Russia will close the gap, Albaugh says. "The U.S. aerospace industry has both enormous opportunity and challenges ahead. The question is, will we rise to the challenges or watch as other companies and other nations seize both the opportunity and the mantle of aerospace leadership?"

### Aerospace is the best internal link to heg- achieves strategic, operational and tactical objectives

USAF, 2k [United States Air Force, “Organization and Employment of Aerospace Power,” Air Force Doctrine Document 2, February 17, 2000, <http://www.iwar.org.uk/military/resources/aspc/pubs/afdd2.pdf>, DA 7/15/11]//RS

Aerospace power is the use of lethal and nonlethal means by aerospace forces to achieve strategic, operational, and tactical objectives. Aerospace power can rapidly provide the national leadership a full range of military options for meeting national objectives and protecting national interests. From peacetime engagement to deterrence, from crisis response to winning wars, aerospace forces offer rapid, flexible, and effective lethal and nonlethal power. Due to its speed and range, aerospace power operates in ways that are fundamentally different from other forms of military power. Aerospace power has the ability to focus the entire theater’s efforts onto a single target or target set, unlike surface forces that typically divide up the battlefield into individual unit operating areas. Airmen view the application of force more from a functional than geographic standpoint and classify targets by the effect their destruction has on the enemy rather than where the targets are physically located.

### U.S. hegemony prevents nuclear wars across the globe

Robert Kagan, senior associate at the Carnegie Endowment for International Peace and senior transatlantic fellow at the German Marshall Fund, August/September 2007, The Hoover Policy Review, online: http://www.hoover.org/publications/policyreview/8552512.html, accessed August 17, 2007

The jostling for status and influence among these ambitious nations and would-be nations is a second defining feature of the new post-Cold War international system. Nationalism in all its forms is back, if it ever went away, and so is international competition for power, influence, honor, and status. American predominance prevents these rivalries from intensifying —  its regional as well as its global predominance. Were the United States to diminish its influence in the regions where it is currently the strongest power, the other nations would settle disputes as great and lesser powers have done in the past: sometimes through diplomacy and accommodation but often through confrontation and wars of varying scope, intensity, and destructiveness. One novel aspect of such a multipolar world is that most of these powers would possess nuclear weapons. That could make wars between them less likely, or it could simply make them more catastrophic.

### **Aerospace is key to prevent cyber warfare.**

Givhan, Trias & Allen, 11 [Walter D. Givhan, Eric D. Trias, William H. Allen, QUALS, “The Criticality of Defense-Focused Technical Education,” Air & Space Power Journal, Vol XXVI, No. 2, Summer 2011 Edition, <http://www.airpower.au.af.mil/airchronicles/apj/2011/2011-2/2011_2_02_givhan.pdf>, DA 7/13/11]//RS

New Domains, New Challenges As the Air Force mission expands, the breadth and depth of technical education requirements for our leaders continue to grow as well. Just as Schriever led the Air Force into space, so is a new generation of leaders pointing the way into cyberspace. This new war-fighting domain needs enormous amounts of STEM investment at all ranks and skill levels. Unlike air and space domains, the cost of entry to exploit cyberspace is low, yet the potential damage to the **national security and economy is enormous**. The complex cyberspace domain evolves at an astonishing pace. 4 Training is essential but not sufficient to ensure success. Therefore, we must also educate our force to anticipate, evaluate, and develop solutions to unforeseen problems in order to guarantee superiority in cyberspace. In response to the demands of Air Force Space Command, AFIT expanded its frontline role in educating these rising technical leaders by adding cyber professional continuing education to cyber graduate education and developmental education. This targeted, multitiered education delivers cyber-focused research projects and, more importantly, degree- or certificate-holding graduates who are technically prepared to move the Air Force into the cyber domain. The Air Force continues to face difficult challenges as well as ever-growing pressure to become more efficient. One area of renewed focus stems from the Air Force’s prioritization of its nuclear enterprise. Air Force Global Strike Command leads the charge but receives support from numerous entities that have an interest in the nuclear arena. The Secretary of Defense Task Force on Department of Defense (DOD) Nuclear Weapons Management singled out the underlying importance of education and training as key tools for generating a culture of nuclear excellence. 5 AFIT responded by revitalizing its nuclear engineering programs and offering certificate programs in addition to traditional graduate degrees with a revamped curriculum. It remains the sole source for defense-focused graduate degrees in nuclear engineering for both the Air Force and Army. Unlike civilian nuclear engineering programs that emphasize power generation or medical applications, those offered by AFIT address the essential task of solving unique defense problems. Besides safety and security of nuclear materials, the DOD has special requirements to study nuclear weapons’ effects and their applications. Those demands drive the need for the corresponding defense-focused education and research readily available at AFIT. Globalization, accompanied by reliance on resources, solutions, and human capital outside our borders, increasingly challenges our effort to maintain technical dominance. Technical innovation is at risk unless we continue to develop an indigenous pool of scientists and engineers from which the DOD and Air Force can draw to meet their needs. …IT CONTINUES… These kinds of examples show the value of a core technological education capability and of highly educated technical graduates in ensuring that the modern Air Force remains on the edge of innovation. Their research and classroom projects feed into war-fighting operations and research programs around the country. At the same time, state-of-the-art research reaches back to inform and refresh the classroom. This symbiotic relationship between research and curriculum requires a critical mass of students, faculty, and funding to thrive and generate the intended results. A robust technical program will produce capable technical leaders and show the way to potentially game-changing technology. **Without a steady stream of defense-focused, technically educated individuals, every aspect of the technologically demanding Air Force mission will suffer**. With graduates in such high demand, AFIT has transformed our educational methods by using Internet and satellite technology to bring itself to the Airman in addition to bringing the Airman to AFIT. These efforts produced 28,000 graduates of professional continuing education last year alone, in addition to 320 graduates with MS degrees, 31 with PhDs, and 2,600 from civilian institutions. The Future A recent report by the National Research Council of the National Academies identified the loss of technical competence within the Air Force as an underlying problem in several areas of science, engineering, and acquisitions. 7 At the same time, the Report on Technology Horizons, Headquarters US Air Force’s vision for science and technology, recognizes that the capabilities we need also lie within the reach of potential adversaries because of their access to the same science and technology. 8 In the midst of budgetary constraints, **advances in technology are imperative to increase manpower efficiencies as well as enhance the Air Force’s capabilities**. Several areas in which AFIT research and education directly support the Report on Technology Horizons vision include cyber resilience, adaptable autonomous systems, operating in an environment without benefit of the Global Positioning System (GPS), rapidly composable satellite systems, and improvement of space situational awareness. In the spirit of the Report on Technology Horizons, this edition of Air and Space Power Journal contains a small sampling of articles covering critical areas of research in cyberspace, energy and fuels, GPS alternatives, and technology that can improve wartime effectiveness and operational efficiencies. As was the case with General Schriever and development of the ICBM force, these advances can occur efficiently and effectively only with the guidance and vision of leaders who have a solid grounding in science and technology that includes technologically focused education. Early on, Gen Henry “Hap” Arnold realized that scientists and engineers were the kind of people who would bring him the ideas he needed. 9 According to the Air Force Science and Technology Strategy, which serves as the cornerstone of all of the service’s science and technology activities, maintaining our technological dominance faces a challenge from globalization and other nations’ ready access to the technology and human capital that make possible the development of advanced capabilities. Furthermore, innovation is at risk unless the United States can develop scientists and engineers well grounded in STEM and attract them to careers in the Air Force. 10 AFIT serves as a key resource in meeting the need for well qualified STEM professionals.

### Cyber war causes endless war, economic crisis, heg decline and resource wars

Tiller, 7/11 [Jim Tiller, VP of Security Professional Services, “On Cyberspace, Cyber Security, and War,” Secure Thinking, <http://www.btsecurethinking.com/2011/07/on-cyberspace-cyber-security-and-war/>, DA 7/15/11]//RS

I started giving a number of speeches about cyber war. Funny thing was, back then, most of the audience concluded I was simply nuts. The concept that a war could occur in cyberspace seemed so surreal to most people. Given how reliant we are on the digital world I thought it was obvious that issues in cyberspace would have implications in the physical world and the two would eventually become inseparable. With the rash of cyber policies emerging from governments, the recent report that the Pentagon has noted that computer sabotage coming from another country can constitute an act of war is entirely predictable. Today, technology – interconnected and interdependent technology – has become so integrated into how we function it’s nearly invisible. It’s not simply e-mail, Twitter, Facebook, cable TV, and iPads, but that’s what you see every day. Technology is what moves trains and trucks, electricity and water, food, fuel, and, importantly, money. It enables resources, such as emergency services, military, textiles, communication, transportation, and intelligence. Technology, or more specifically cyberspace – a genera term representing a digital ecosystem – is a resource. And, it is a resource that has become essential to all other resources. As such, i**t is a force multiplier and can have far reaching effects**. Although it may be hard to imagine, it is not beyond comprehension that a cyber-attack could result in the loss of life directly and indirectly. Disruptions in the digital world can have resonating impacts, most notably in the form of resource impedance, such as shutting off electricity, disabling the banking system, or shutting down the transportation infrastructure. It can affect production leading to economic instability and downstream civil unrest. We need to take a defensive stance to protect our resources, because without it, the country will dissolve and cyber space is no different from the other resources we seek to protect. The resort to war is human and is usually a result over competition for resources. Accumulation of resources means power and, eventually, someone wants your resources and your power, or wishes harm against you because of your power. To ignore this is ignorance and denial resulting in being unprepared, ineffective, and, frankly, doomed.

### Plan solves aerospace- creates jobs, space tourism and guarantees next generation of industry workforce

Siegfried, 3 [W.H. Siegfried, Program Manager of McDonnell Douglas SEI team with Lunar/ Mars systems technologies, “Space Colonization—Benefits for the World,” The Boeing Company, April 1, 2003, <http://www.aiaa.org/participate/uploads/acf628b.pdf>, DA 7/15/11]//RS

Space Colonization will become an integral part of our 21st century global future. Its effects will be analogous to the great changes that the aviation industry catalyzed in the past century. Many of the needs of the Earth’s burgeonizing population can be ameliorated by the science and technology emanating from a broad endeavor to reach for the stars. Establishing broad new goals will provide motivation for our young. Formation of the colonization industry will provide many jobs and may potentially serve to sublimate ethnic strife. As the adventure travel industry here on Earth has grown through provision of adventure, drama, mystery, heroism, and hope for the future, so too will Space Colonization provide value to humankind.

### The plan solves aerospace 3 ways by being a clear space policy

AIAA, 3/30 [American Institute of Aeronautics and Astronautics, “U.S. MUST DEVELOP A CLEAR AND COMPREHENSIVE SPACE POLICY, AIAA CORPORATE MEMBERSHIP COMMITTEE CHAIR TESTIFIES,” March 30th, 2011, <http://intranet.aiaa.org/industryresources/PDF/MaserTestimony.pdf>, DA 7/14/11]//RS

March 30, 2011– Reston, Va. – Jim Maser, chairman of the American Institute of Aeronautics and Astronautics (AIAA) Corporate Membership Committee, and president, Pratt & Whitney Rocketdyne, Canoga Park, Calif., testified today before the U.S. House of Representatives Committee on Science, Space and Technology’s Subcommittee on Space and Aeronautics on “A Review of NASA‟s Exploration Program in Transition: Issues for Congress and Industry.” Addressing the need to clarify current space policy, Maser told the committee: “The need to move forward with clear velocity is imperative if we are to sustain our endangered U.S. space industrial base, to protect our national security, and to retain our position as the world leader in human spaceflight and space exploration. I believe that if we work together we can achieve these goals, and we are ready to help in any way we can. But the clock is ticking.” In his prepared testimony, Maser stated that the aerospace industry, which directly supports more than 800,000 jobs nationwide, is imperiled by the lack of a clear space policy. Maser explained that the uncertainty that the current space policy imposes on the industrial base creates three unique problems for the nation: first, it makes it impossible for the space industrial base to plan for current or future needs, harming the industry’s ability to meet NASA‟s needs and retain its engineering and science workforce; second, it harms the industry’s ability to recruit future workers because students who are currently enrolled in science, technology, engineering and math (STEM) programs will be wary of entering an enterprise that lacks a clear direction and mission, and which has no guarantee of longevity; and last, it harms U.S. national security by driving up short-term fixed costs for the Department of Defense to offset the uncertainty in the needed volume of materials for a robust military presence in space. Maser noted that while there is uncertainty about the best way to address these problems through the creation of a focused space policy for the nation, there is no doubt that “unfortunately, though, we do not have the luxury of waiting until we have all the answers. We must not „let the best be the enemy of the good.‟ In other words, selecting a configuration that we are absolutely certain is the optimum configuration is not as important as expeditiously selecting one of the many workable configurations, so that we can move forward.”

## U.S Action First Key

### US action first is key- Other countries will look to the US to lead in colonization

Siegfried, 3 [W.H. Siegfried, Program Manager of McDonnell Douglas SEI team with Lunar/ Mars systems technologies, “Space Colonization—Benefits for the World,” The Boeing Company, April 1, 2003, <http://www.aiaa.org/participate/uploads/acf628b.pdf>, DA 7/15/11]//RS

Aside from the more demonstrable returns that would come from Space Colonization, there are a host of intangible benefits (U.S. Office of Management and Budget, 2000; Mankins, 2001; Mankins, 1997; Siegfried, 2000a; Siegfried, 1999). Mankind has always been goal-driven. **The accessibility of journeys to space destinations could become a great motivational factor to the general population and a goal for emerging societies** (Koelle, 2002). It could become a new commercial industry similar to the explosive growth of travel and adventure trips spawned by the jet age. We could expand our living space, create at least a second home for Earth-based life forms through development of lunar colonics and, eventually, perhaps terraforming Mars. We can potentially sublimate some of our ethnic strife in a common reach to the universe. We will better understand our Earth’s environment and evolutionary history and rekindle the spirit of adventure that we experienced during the frontier days. Space Colonization will benefit from burgeoning technology here on Earth but will also spawn the creation of as-yetundreamed leaps. It could lead to potential storage or disposal venues for waste material and, by its very nature, provide the impetus for whole new generations of transportation, housing, and environmental control systems. The development of low-cost access systems will spawn flight rates similar to our terrestrial tourist frequencies and, coupled with the development of new space businesses and a space infrastructure, will implement humankind’s expansion throughout space. It has been 30 years since we left our Moon. It is time to return, this time to stay (Siegfried, 1997; Siegfried, 2001; Siegfried, 2000b).

## Now Is Key Warrants

### The Golden Age of Aerospace is over- Washington can no longer afford to create jobs

Cohen, 6/20 [Aubrey Cohen, aerospace reporter and graduate of Northwestern University in political science and Russian Studies, “The golden age of aerospace is over,” June 20, 2011, <http://blog.seattlepi.com/aerospace/2011/06/20/%E2%80%98the-golden-age-of-aerospace-is-over%E2%80%99/>, DA 7/14/11]//RS

Washington’s biggest advantage in luring and keeping aerospace jobs may also be its biggest problem: its workers. “You essentially have an off-the-shelf work force that understands how to work in the aerospace industry and has the support from the politicians and the local community for that,” Ray Goforth, executive director of the Society of Engineering Employees and Aerospace union, said in an interview earlier this month. Tom Captain, vice chairman and Global and U.S. Aerospace & Defense leader for Deloitte, agreed. “The Puget Sound area is the aerospace capital of the world,” he said. “That labor pool is extremely valuable.” But the cost of these workers and their reputation for union activism have kept Washington from being a serious player in recent fights to win aerospace production jobs, according to Captain. “It’s got a high cost of labor, it’s not a right-to-work state, and the incentives that can be provided have pretty much been exhausted due to the economic condition of the state,” he said. “We’ve lost several major competitions that could have come our way to create thousands of jobs.” Now, union leaders are joining Washington Gov. Chris Gregoire at the Paris Air Show as part of an effort to sell the state to aerospace companies and help ensure it doesn’t suffer the same fate as another place with some of the most-experienced, most-expensive industrial workers: Detroit. “We want to entice those suppliers that we currently have here to expand, those that are not here to consider coming,” Gregoire said before leaving for Paris. But globalization of the industry mean Washington has permanently passed its peak, particularly for production jobs, Captain argued. “**The golden age of aerospace is over**.”

### **Now is key- US Aerospace is doomed after giving the space monopoly to Russia**

**Hotz, 7/7** [Robert Lee Hotz, QUALS, “Shuttle’s Last Flight Leaves Russia With Space Monopoly,” July 7, 2011, The Wall Street Journal, Factiva, DA 7/13/11]//RS

Circling the Earth every 90 minutes, the International Space Station is the most expensive project ever assembled in space. Within days, it will hang by a single, costly thread. And Russia, the U.S.'s historic rival in space, is holding it. The last U.S. space shuttle is scheduled to blast off Friday. After that, the U.S. and other nations will rely on vintage Russian spacecraft to ferry their astronauts to the $100 billion station. Russia will hold a monopoly over manned spaceflight, and tensions already are rising. The Russians are in the process of nearly tripling the cost of using their Soyuz crew capsules for transport to the orbiting base, and other countries have little choice but to pay up. "We are not in a very comfortable situation, and when I say uncomfortable, that is a euphemism," said Jean-Jacques Dordain, director general of the European Space Agency, one of five international agencies that jointly manage the orbiting laboratory. "We made a collective mistake." The Soyuz represents the triumph of a low-cost approach to human space exploration. The Russian capsules are launched on massive expendable rockets, carrying astronauts in a kind of guided cannonball to and from orbit. By contrast, the U.S. built its space program around the most complex flying machine ever, the reusable space shuttle. While the U.S. has spent $209.1 billion on the space shuttle since its inception, the entire Russian space program currently costs just $2 billion a year. "Today, reusable ships are a very expensive pleasure, and economically they're not really justified," Vladimir Popovkin, the newly appointed head of Roskosmos, the Russian space agency, told a Russian newspaper last month. Officials at Roskosmos didn't provide comment for this article. The Russian monopoly on manned spaceflight won't last forever. If all goes as NASA plans, the Russian monopoly will end in 2016 when the agency hopes to take its pick of several new commercial crew transports currently on the drawing board. NASA is now seeking a commercial space-taxi service -- designed, built and operated by the private sector -- to cut costs while speeding the pace of development. "We are working aggressively to get our own crew capability," said William Gerstenmaier, NASA's associate administrator for space operations, the chairman of the international board that oversees the space station. Since President George W. Bush announced the end of the space-shuttle program in 2004, the Russian space agency has increased the price of taking U.S. astronauts to the space station eight times. By terms of the latest contract, each seat on a Soyuz crew capsule will cost NASA **$63 million by 2016 -- a 175% price increase** since 2005, according to a new agency audit. The largest single price increase takes effect later this summer, coinciding with the conclusion of the last space-shuttle mission. It will cost U.S. astronauts $43.4 million apiece to fly aboard the Soyuz later this year, a 57% increase from the first-half cost. The Russian government is unlikely to use its current monopoly over access to the space station as a diplomatic pressure point, but it would certainly take commercial advantage, several U.S. space experts said. The Russians haven't crowed over the demise of the space shuttle. Alexei Krasnov, head of manned programs at Roskosmos, told a Russian newspaper last month, "Even though the U.S. will be paying us to use our Soyuzes, giving up the shuttles isn't good for Russia." His country is a big backer of the International Space Station, and he noted that it would have been impossible to build the station without space shuttles. "It would be better for us if the shuttles continued to fly, even just once a year," he said. The space station was originally conceived as a platform for sending spacecraft to other planets. But its mission has changed into an orbiting laboratory to conduct experiments on how humans and other organisms fare in a low-gravity environment. The hope is to understand more about basic life function and to discover new medical treatments and vaccines. And humans are needed to conduct, or be participants in, many of these experiments. So far, NASA has purchased 46 seats for Soyuz flights through 2016, and it wants to buy more. NASA officials attribute the price hikes to inflation and the increased cost of making more Soyuz spacecraft, which the Russians have been manufacturing for almost 40 years. The Russians have continued to tweak the Soyuz, and have a new version coming out this year. In April, **NASA awarded a total of $269.3 million to five U.S. aerospace companies to develop systems for transporting humans to the space station.** One of them -- Space Exploration Technologies Corp., based in a Hawthorne, Calif. -- appears to be furthest along, experts said. It pledged to build a reusable system that could ferry seven astronauts into orbit for as little as $20 million each -- a fraction of most forecasts of future crew-transport costs. "It has to be done for an amount of money that taxpayers are willing to pay," said Space Exploration Chief Executive Elon Musk, who co-founded PayPal and Tesla Motors. "That should allow NASA to transport a much greater number of astronauts and to get much more use out of the space station." **A NASA-sponsored analysis by Aerospace Corp., one of the agency's most influential outside advisers,** is less sanguine. It **forecast future transportation costs** at $90 million to **more than $150 million per seat**. Space Exploration already has a $1.6 billion NASA contract to ferry supplies to the space station using its experimental Dragon spacecraft and its Falcon rocket, beginning next year. In April, NASA awarded the company an additional $75 million to build a launch-escape system for the Dragon spacecraft -- a key component in converting it into a crew transport. Despite pioneering accomplishments -- including launching and successfully recovering the first private spacecraft from orbit -- Mr. Musk and his company have wrestled with technical problems and launch failures that have dragged out schedules and lowered expectations. To keep pace, Mr. Musk said he planned to skip a test flight of the unmanned Dragon spacecraft originally scheduled for this summer and test the craft's ability to safely dock in orbit with the space station by the end of the year. Officials at Roscosmos, however, warned in April they wouldn't let the unmanned Dragon spacecraft fly near the space station or dock with it any time soon -- not until they deem it safe. In 1997, Russia's Mir space station was badly damaged when a cargo module slammed into it. International Space Station Manager Michael Suffredini at NASA discounted the Russian safety concerns. "Sometimes the Russians say things without having all the data at their fingertips," he said. Nonetheless, NASA hasn't yet worked out all the procedures for certifying the safety of the various new crew craft, the agency's inspector general reported last week. **With each delay, the likely gap between the final shuttle trip this week and deployment of a U.S. replacement threatens to grow**. The companies "will take a little longer to get online than they tell us," Mr. Suffredini said. "I would not expect to see anybody until late 2016." Indeed, NASA's inspector general last week warned that private companies may take so long to develop safe commercial crew transportation that it could threaten U.S. access to the space station. "It is still a very risky bet that one or more of these companies can come up with an affordable and sustainable way for crew transport," said George Washington University space-policy analyst John Logsdon. "For the time being, American astronauts will be taking Russian taxis." In fact, **NASA is already moving to buy more seats for U.S. astronauts aboard Russian crew capsules in case commercial development continues to fall behind schedule.** Currently, NASA has purchased seats on the Russian Soyuz only through 2016, and doing so required a congressional waiver of legal limits on technological trade with Russia. To purchase more Soyuz seats, the agency will need additional congressional approval, which it is seeking. Despite its rising ticket price, the Soyuz capsule is a relative bargain compared to the cost of the NASA space shuttle, largely because the vehicles represent radically different engineering approaches to human spaceflight. In many ways, the Soyuz resembles the Apollo moon capsules and Saturn rockets used by the U.S. in the 1960s. By contrast, the space shuttle is a reusable winged spacecraft piloted by astronauts who can land it from orbit like a glider. Each shuttle contains more than 2.5 million parts and 230 miles of wiring, operating at extremes of speed, heat, cold, gravity and vacuum. Working in the 1970s, NASA's shuttle designers promised to make civilian manned spaceflight cheap, safe and routine -- a jumping-off point for human voyages to other planets. Shuttle missions would be launched up to 50 times a year. In 30 years of flights, the crafts deployed more than 50 satellites into orbit. They carried more than three million pounds of cargo and 355 people from 16 countries into space. They launched interplanetary probes and major orbital observatories, including the Hubble Space Telescope. In practice, however, the space-shuttle program was never routine, reliable or cheap. A shuttle launch cost $1.5 billion -- 100 times the $10.5 million dollars each that NASA officials promised at the start of the program in 1972. And the agency never came close to achieving the launch rates its designers had predicted. Without the shuttle to rely on, NASA managers have scrambled to revamp the way they operate the space station. They revised the way they plan to repair it and conduct research there in the decade to come, using their last space-shuttle flights to build up orbiting caches of large spare parts that can't fit aboard unmanned Russian, European or Japanese supply craft that currently supply the station. In the end, the U.S. is left to ponder an irony: It won the technological race to develop a space shuttle but lost the war. "You can argue that the Russians were on the right trajectory all along, by flying big, dumb boosters," said Duke University space historian Alex Roland.

## Solvency

### Space colonization saves the aerospace industry.

**Bell, 7/12** [Larry Bell, professor at the University of Houston, founder and director of the SasaKawa International Center for Space Architecture, “Does The United States Still Care About Space Leadership?,” July 12 2011, <http://blogs.forbes.com/larrybell/2011/07/12/does-the-united-states-still-care-about-space-leadership/>]//RS

So what have we really gained from these space developments up until now, thus warranting rededicated leadership and investment? Consider the answer from your personal experience, but with a few broad issues in mind. First, we’ve all heard about unexpected space technology spin-offs — everything from Teflon to the satellite-dependent internet network, with all manner of other “space age” innovations in between. Sure, those products and discoveries appear endless, but a lot of them might well have occurred as a result of free market innovation incentives anyway. Yes, space exploration programs produce technological innovations, but even more, don’t they produce inspiration for our children, grandchildren and other generations who follow to realize that the sky is literally no limit to what can be achieved with ambitious goals, solid educational foundations and disciplined commitment? They will be the ones that advance future innovation and progress in all fields. Contributions to encourage vision, leadership and competence are vital products that will drive our nation’s future – and theirs as well. Then there’s the matter of national security and prestige reflected by technological superiority. After all, that priority really got our space program off the ground from its inception. Despite diminished superpower competition that attended the Soviet Union’s implosion, it’s hard to dismiss some lingering concerns that validate needs for continuing progress in these areas as well. Of course, we could rely on a military space program for much of that, and forget about winning approval for appearing to be nice. But again, doesn’t our national security most fundamentally depend upon the continued vitality of our economy…our ability, among other things, to stay ahead of the technology curve? Here, space exploration has served to stimulate interests of young people in science – and engineering – based studies, providing lessons and problem-solving challenges that apply at all levels of learning. Sadly, however, many of the technical programs in top-ranked U.S. universities are now dominated by students from Asia and India. In China, strong math and science backgrounds are prerequisites for admittance to the best universities or to be hired by foreign corporations operating there. The Microsoft research center in Beijing is one of the most sought-after places there, and the competition is fierce. There is a popular saying: “If you are one in a million, there are 1,300 people just like you.” It’s difficult to ignore the symbolic and real benefits of international cooperation and national prestige gained through space exploration developments. But I submit that there is something else that our programs represent of equal or even greater value. Namely, it is less important how the rest of the world views us; instead it’s about how we see ourselves: as a culture willing to take risks in quests for uncertain, yet potentially unlimited rewards; as a nation that recognizes that to not do something presents one of the greatest risks of all; because that’s the sort of people we are. In short, because we are Americans.

### Obama agrees aerospace is the best internal link to the economy- the sector supports the most jobs

ITA ’11 [International Trade Administration, “AEROSPACE INDUSTRY IS CRITICAL CONTRIBUTOR TO U.S. ECONOMY ACCORDING TO OBAMA TRADE OFFICIAL AT PARIS AIR SHOW,” <http://trade.gov/press/press-releases/2011/aerospace-industry-critical-contributor-to-us-economy-062111.asp>, DA 7/14/11]//RS

PARIS – Francisco Sánchez, Under Secretary of Commerce for International Trade, addressed national and international groups at the 2011 Paris Air Show to reinforce the President’s National Export Initiative (NEI) and support the U.S. aerospace industry. “The U.S. aerospace industry is a strategic contributor to the economy, national security, and technological innovation of the United States,” Sánchez said. “The industry is key to achieving the President’s goals of doubling exports by the end of 2014 and contributed $78 billion in export sales to the U.S. economy in 2010.” During the U.S. Pavilion opening remarks, Sánchez noted that **the aerospace sector in the United States supports more jobs through exports than any other industry**. Sánchez witnessed a signing ceremony between Boeing and Aeroflot, Russia’s state-owned airline. Aeroflot has ordered eight 777s valued at $2.1 billion, and the sales will support approximately 14,000 jobs. “The 218 American companies represented in the U.S. International Pavilion demonstrate the innovation and hard work that make us leaders in this sector,” said Sánchez. “I am particularly pleased to see the incredible accomplishments of U.S. companies participating in the Alternative Aviation Fuels Showcase, which demonstrates our leadership in this important sector and shows that we are on the right path to achieving the clean energy future envisioned by President Obama.” The 2011 Paris Air Show is the world’s largest aerospace trade exhibition, and features 2,000 exhibitors, 340,000 visitors, and 200 international delegations. The U.S. aerospace industry ranks among the most competitive in the world, boasting a positive trade balance of $44.1 billion – the largest trade surplus of any U.S. manufacturing industry. It directly sustains about 430,000 jobs, and indirectly supports more than 700,000 additional jobs. Ninety-one percent of U.S. exporters of aerospace products are small and medium-sized firms.

### Plan solves the economy 3 ways- Technology spinoffs, space tourism and job creation

Siegfried, 3 [W.H. Siegfried, Program Manager of McDonnell Douglas SEI team with Lunar/ Mars systems technologies, “Space Colonization—Benefits for the World,” The Boeing Company, April 1, 2003, <http://www.aiaa.org/participate/uploads/acf628b.pdf>, DA 7/15/11]//RS

SPACE COLONIZATION WILL HAVE MANY BENEFICIAL ASPECTS A complete list of potential world benefits from Space Colonization is lengthy, even when confined to technological items. Included are access to space resources that include quantities of almost every resource we have on Earth except fossil fuels; an improved understanding of the complex systems that comprise our climate; conducting experiments in chemistry, biology, physiology, and even sociology that cannot be conducted here on Earth; and developing new technologies for use on Earth. All are the bounty of Space Colonization. There are also many sociological benefits of Space Colonization. We must remember that such an endeavor cannot be implemented by one any agency or single government. A world policy would be needed. In the United States, the combined efforts of NASA, DOE, DOI, DOT, DOC, and others would be focused in addition to our broad industrial base and the commercial world. It should be noted that the eventual space tourism market (tapping in to the world annual $3,400 billion market or the United States $120 billion per year “adventure travel” market) (Reichert, 1999) will not be based on the work of isolated government agencies but, rather, evolve from a synergistic combination of government, travel industry, hotel chains, civil engineering, and, yes, a modified version of industry as we know it today. The change in emphasis from our present single-objective missions to a broadband Space Colonization infrastructure will create employment here on Earth and in space for millions of people and will profoundly change our daily life on Earth. This venue, initiated by short suborbital followed by short orbital and then orbital hotel stays (Collins, 2000) has already begun with brief visits to the ISS. Once systems evolve that can reduce the cost of a “space ticket” to some $10,000 to $50,000 US, the market will grow. Fig 2 is typical of studies on space tourism passengers that could be expected vs. costs of the trip. Space Colonization Will Influence the Sociology of Our World Included herein are jobs and education incentives and potential synergistic effects of Space Colonization. As a model, we will utilize United States data because similar worldwide data are not available. The general effect of civil space on the United States economy is summarized in Table 3, based on data from 1990. Over and above the direct benefits received by the states having major aerospace industry, there are indirect benefits to all states, for people buy goods and services (such as cars) with the money they earn. This can range from 4-to-1 ratios in the major states benefited to as high as 10-to-1 ratios in states such as Michigan, Oklahoma, and Kentucky. The numbers here are the number of dollars realized for every dollar spent.

### Plan saves the aerospace industry, heg, environment and competitiveness

Douglass, 3/10 [John Douglass, President & CEO Emeritus, Aerospace Association, “Testimony of John Douglass,” DA 7/14/11]//RS

However, the future economic growth of the U.S. aerospace industry along with Ohio’s depends on the successful number of policy issues including: • Modernizing the export control system - By making the U.S. export control system more predictable, efficient and transparent, the U.S. government can help sustain and grow the defense industrial base through exports and lower unit costs for defense acquisitions. AIA welcomes the administration’s initiatives to develop a single licensing agency, a single technology control list, a single enforcement fusion center and a single IT infrastructure for export licenses. In the process, attention must be paid to restructuring the U.S. Munitions List and the Commerce Control List, development of a program license approach supporting the U.S. military’s most critical systems, reforming the Defense Department’s Technology Security and Foreign Disclosure system and differentiating treatment of Unmanned Aircraft Systems on the Missile Technology Control Regime. • Developing an efficient acquisition system - Fair acquisition policies are needed to maintain a competitive defense acquisition environment and a healthy defense and aerospace industrial base. These policies should encourage and reward good performance, promote fairness and stability, incentivize cost savings and establish balanced and equitable risk-reward financial relationships. • Establishing an industrial base policy – As World War II ended and America emerged as the leading economic and military power, a large industrial base developed that used competition and innovation to design and build the wide range of weapons that defined American military capability for more than 50 years. But that industrial base no longer exists primarily because of industry consolidation and the reduction of the numbers of weapons systems that are being produced and spaced further apart. In its 2010 Industrial Base report, DOD expressed concern about the risk of atrophy and the potential loss of key design and development capability. This outcome could be closer than many think. For the first time in 100 years there is no manned military or civilian aircraft in design in the United States. We believe that the industry may not be able to respond to future aerospace and defense needs in a timely and effective manner unless policies are adopted to preserve a minimum effective capability to design, build and support militarily unique weapons. • **Encouraging the development of the next generation of aerospace workers** – A major long-term threat to our preeminence in aerospace comes from our own demographics. The generation of talent that won the space race and the Cold War is reaching retirement age and America is not producing the number and quality of scientists, engineers and technicians that is necessary to replenish those ranks. The numbers are stark: almost 60 percent of the aerospace workforce was 45 years or older in 2007. Twenty-seven percent of the aerospace engineering workforce was eligible for retirement in 2008. Several of our companies report that within 10 years half their workforce will become retirement eligible. • Promoting competitiveness through tax policy – Adapting a tax code that adheres to the principles of efficiency, innovation, competitiveness and simplicity will pay dividends for U.S. business. Companies will have more business, there will be more jobs for Americans and the nation will experience more economic growth. Congressional action on repealing the three percent withholding tax, making the research and development tax credit permanent and lowering corporate tax rates would be excellent first steps forward. • Maintaining America’s leadership in space - U.S. space efforts – civil, commercial and national security – drive our nation’s competitiveness, economic growth and innovation. Our space industrial base designs, develops, produces and supports our spacecraft, satellites, launch systems and supporting infrastructure. Given the growing U.S. dependence on these systems and their contribution to the global economy, our nation cannot afford to lose its preeminence in space. We need to maintain – and in some cases restore – the vitality of our space programs to prevent irreparable harm to our national economic and security interests. • Developing the Next Generation Air Transportation System – Replacing our World War II-era radar air traffic navigation system with a satellite-based system will enable planes to safely fly closer together, providing pilots a complete, real-time picture of all air traffic will transform our National Airspace. The economic and environmental benefits forecast to the civil aviation industry once NextGen is fully implemented are impressive. Routing and delay-reducing efficiencies will save billions of dollars annually and save more than a billion gallons of fuel. Those conservative estimates will provide an economic return on government investment in less than three years and will be the environmental equivalent of removing 22 million cars off the road. The FAA has already invested over $3 billion in the Next Generation Air Transportation System and plans to spend up to $20 billion more. . However, one of the largest challenges to our industry and the nation is reducing the federal debt. It’s important that as Congress debates spending levels and programs that it not make ill-considered cuts to an industry that is vital to our economy, prosperity and national security. In closing, I’d like to congratulate the organizers of Ohio Aerospace Day for undertaking this event. As we’ve heard from today’s panel, Ohio is a critical part of the contribution the U.S. aerospace industry makes to our nation, which is a true economic engine for the U.S. economy. As we work to solve our fiscal problems, important to remember that aerospace generates positive economic activity for our nation in addition to being a bed rock of our national security. Finally, I hope that everyone today will participate in National Aerospace Week, organized by the Aerospace Industries Association, and scheduled for Sept. 11-18, 2011.

### Experts believe we must settle on the moon before money and time runs out Bunn, 6/1 [Darcy Bunn, MIT Graduate in Aeronautics and Astronautics and he tested the Cassini spacecraft, June 1st, 2011, “U.S. Space Program Has A Goal: Settlement,” <http://www.thespacegeneration.com/tag/colonization>, DA 7/14/11]//RS

Jeff Greason of XCOR Aerospace put on his space advocacy hat at the International Space Development Conference (ISDC) 2011 in Huntsville, AL to call for a workable strategy for NASA. (credit: NASA) Some people think that the problem with the United States space program is it does not have a clear goal. Jeff Greason, CEO and co-founder of XCOR aerospace, disagrees. He believes there is a decided goal, whether it is said out loud or couched in space industry jargon: settlement. By this he means settlement of worlds outside our planet, such as the Moon or near earth objects, or the big fish – Mars. This is a video that was recorded in Huntsville, Alabama at the International Space Development Conference. It is an example of how clear, intelligent thought, business experience and aerospace experience can come together into a cohesive vision for the space program. Jeff Greason – A Settlement Strategy For NASA from Moonandback Media on Vimeo. Greason explains that the space program currently is not missing a goal, because the goal is settlement. However, it is missing a strategy. He talks about the steps NASA is striving to take now, to put boots on the Moon again, or boots on an NEO, or boots on Mars…and then???… and then there will be settlement. The missing piece is a strategy to arrive at the goal of settlement. And there is the problem of funding, which decreases every year, a battle which Greason says we can’t win. So he wants to see a workable strategy that can use the available money before it is too late. Greason’s strategy changes the paradigm of how space industry is done in the U.S. He emphasizes the importance of contacting elected representatives about this. My understanding is that he wants NASA to still be the head coordinator of the space program, with an important role in developing advances that would not be able to come from the private sector because there would be no demand for these technologies outside the specific activities NASA is undertaking. Yet there would be a role for private industry which NASA would also facilitate, in areas where customers other than the government would be helping bring down the cost of these developments. Greason’s Mars settlement strategy would cut costs by enabling refueling in space, a plan which would incorporate use of robotic mining facilities operated by humans living on site (on the Moon, or on one of Mars moons for instance). It is an exciting vision. I am interested in seeing this play out. I wonder if anyone is working on a forum for contacting legislators about this, online petitions and the like. There are high quality minds -like Greason’s- with good ideas that can provide real solutions to move the space program forward. We should not let them be stymied by bureaucracy.

## Terrorism Impact

First internal link:

### **Aerospace prevents terrorists from using MANPADS**

Sonawanel & Mahulikar**,** June 2011[Hemant R. Sonawanel, QUALS, Shirpad P. Mahulikar, QUALS, a Department of Aerospace Engineering, Indian Institute of Technology Bombay, Aerospace Science and Technology, “Tactical air warfare: Generic model for aircraft susceptibility to infrared guided missiles,” Volume 15, Issue 4, June 2011, Pages 249-260, <http://www.sciencedirect.com.turing.library.northwestern.edu/science/article/pii/S1270963810000970>, DA 7/13/11]//RS

The contrast emanating by infrared emissions of aircraft vis-à-vis the atmosphere in which it operates is used to detect and track the aircraft. This passive detection and tracking is tactically advantageous in combat warfare. Guided missiles utilize infrared sensors and such missiles have emerged as a major cause of aircraft destruction. **Availability of** Man Portable Air Defense Systems (**MANPADS) to terrorist organizations and attacks on civilian aircraft has compelled aerospace researchers to contemplate on aircraft susceptibility against IR guided missiles**. These days stealth is the foremost quality desired in combat aircraft acquisition. Low observable features are discussed on top priority and incorporated in the design stage of aircraft itself; to make aircraft inherently survivable against IR threat, i.e. IR guided missiles [24]. Introduction of stealth technology was an important step in aircraft survivability but also raised some issues [17]. How to quantify survivability and how much signature reduction is required to acquire desired survivability? Features which improve IR stealth are not immune from side effects. Performance penalties, additional weight and extra cost are some of the issues required to be addressed for aircraft survivability trade-off. The level of susceptibility of an aircraft under threat is dependent upon three main factors, viz. the threat, the aircraft and the scenario [1]. Important features of the threat, if it is an air-to-air (AAM) IR guided missile, include its speed, burnout range, blast kill radius, NEI of detector used, etc. Aircraft performance, IR signature level of aircraft, and countermeasures used are some of the factors associated with aircraft. The scenario includes the environment in which the aircraft and threat encounter occurs and factors like transmission of IR signal in atmosphere, aircraft flight path and tactics, etc. Aircraft IR signature prediction, atmospheric transmission of infrared radiations, aircraft IR signature suppression and use of imaging IR detectors are the main thrust area in IR signature studies of aircraft currently undertaken by researchers of major military establishment of the world. A**ll major military powers have developed their own standard IR signature models**. Quite a sizable number of patents have been awarded in this field. Due to its military application the majority of research in this field is kept classified and very few details are available in open literature. The susceptibility of aircraft to IR guided missiles is scantly reported in the open literature. Keeping in view the capabilities of presently available IR guided missiles, the nature of IR emissions from aircraft and the contrast between aircraft emissions and atmospheric radiance in IR spectrum it is utmost important to find out the degree of susceptibility of present day aircraft. This information is immensely useful in identifying potential IR signature reduction/suppression areas/zones on aircraft, and quantification of signature level reduction for desired level of survivability enhancement. A susceptibility analysis involves various one-to-one simulations of the aircraft and the possible threat [25]. In the present study a typical air-to-air battle scenario is presented to analyze the aircraft susceptibility to IR guided missiles. 2. Aircraft susceptibility to IR guided missiles An aircraft if detected, tracked and destroyed in combat warfare is referred as a susceptible aircraft. Aircraft loss in combat is random in nature and hence aircraft survivability is measured by probability [1]. Similarly aircraft killability is measured by the probability the aircraft is killed in combat mission. Probability of aircraft survival (PS) and probability of aircraft killed (PK) are mutually interrelated. Therefore, (1)PS=1−PK and the killability of aircraft depends upon the susceptibility and vulnerability of the aircraft [1]. Aircraft susceptibility to direct hit is measured by probability of hit (PH) and aircraft vulnerability to warhead is measured by conditional probability (PK/H) that the aircraft is killed given that it is hit by the warhead [1]. Thus, (2)PS=1−PHPK/H Aircraft equipped with active (IR decoys) and passive (IR suppressors) countermeasures reduce susceptibility to lethal warheads (IR missiles) and hence they have enhanced survivability. A surface-to-air (SAM) and air-to-air (AAM) IR guided missile lock-on to the aircraft due to the contrast observed in IR emissions of aircraft vis-à-vis that of the atmosphere in which it operates. Thus IR guided missiles have fire and forget capabilities. A lock-on envelope is the locus of points around aircraft from which the missile can lock-on to the target. The lock-on range depends upon the strength of contrast IR signal (between aircraft IR emissions and the atmospheric radiance) and the sensitivity of the IR detector. Due to advancement in IR detector technology present day IR guided missiles are constrained by their burnout range rather than lock-on range [19]. Therefore lock-on envelope is insufficient to describe the aircraft susceptibility to IR guided missiles. More comprehensive criterion for aircraft susceptibility based on aircraft speed, missile speed, lock-on range, burnout range was presented by Rao and Mahulikar [19]. In the surface-to-air missile scenario the lethal envelope is the maximum range from the launch site where a launched missile can fly out, intercept and cause lethal damage to aircraft [1]. The lethal envelope is plotted by finding farthest locations of target around the launch site where the PK associated with the shot is high. In an air-to-air combat scenario the attacker is free to move around the target, hence the lethal envelope is plotted around the target [1]. The nature of IR emissions from aircraft is not uniform in all direction (anisotropic nature) owing to difference in mode of heating/cooling of aircraft fuselage, hot engine parts and plume. The fuselage, hot engine parts and plume differ in their emission characteristics and physical size. Further the contrast observed in IR emissions from aircraft vis-à-vis the radiance of atmosphere in which it operates changes with the aspect. Hence the lock-on is not uniform around the target in an AAM scenario. The constant IR signature level contours are not equidistance from the source. **The largest contributor to IR emission is the direct view of the 600–700 °C power turbine stages** [23]. The aircraft is more susceptible to IR guided missiles from the rear owing to direct visibility of engine parts like nozzle, tailpipe, turbine stages, etc. [21].

### MANPADS kill heg by destroying command and control nodes and spur terrorism

Pike, 5/7 [John Pike, director of Space Policy, at the Federation of American Scientists, member of Council on Foreign Relations, and consultant to NASA’s NEO panel, “Man Portable Air Defense System (MANPADS),” May 7, 2011, http://www.globalsecurity.org/military/intro/manpads.htm, DA 7/14/11]//RS

Man Portable Air Defense System (MANPADS) The Man Portable Air Defense System (MANPADS) missile is a highly effective weapon proliferated worldwide. Typically containing an IR seeker, the missile offers little opportunity for a warning before impact. Impacts are often lethal. Examples of lethality include 1) the Afghan mujahedeen killing of 269 Soviet aircraft with 340 such missiles, 2) Desert Storm evidence that IR missiles produced 56% of the kills and 79% of the Allied aircraft damaged, and 3) civil aircraft experiencing a 70% probability of kill given a MANPADS hit. Such high kill ratios are unacceptable and require immediate solutions. Recent military engagements, such as Desert Fox, demonstrate curtailment of daytime operations as a result of the MANPADS threat. Civil aircraft remain virtual "sitting ducks" to terrorists, who may have acquired Stinger missiles and quantities of Russian-made MANPADS. Vulnerability reduction techniques are needed to insure the survivability of military and civil transport aircraft engaged by MANPADS missile threats. Delaying solutions may prove catastrophic. Whereas susceptibility reduction (hit avoidance) should be regarded as the primary means of aircraft defense, optimal survivability can be achieved through an integration of susceptibility and vulnerability reduction (hit survival) techniques. Vulnerability reduction techniques are particularly necessary during take-off and landing when restrictions to tactics and countermeasures are in-place. Vulnerability reduction techniques are also particularly important for commercial aircraft in that the use of flares and rapid G-maneuvers is not appropriate. Emphasis of the proposed program will be on developing cost effective and low-weight vulnerability reduction techniques for transport aircraft encountering IR MANPADS threats. However, solutions may prove applicable to all aircraft and threats encountered. Low risk example solutions for military-commercial aircraft application include relocating critical components away from hot-spots, locally hardening fixed critical components, moving hot-spots to less vulnerable locations, using sacrificial structure, and improved fire suppression techniques. While each example is expected to enhance transport aircraft survivability, proposed vulnerability reduction techniques need prioritized based on various orders of merit (i.e., cost, weight, effectiveness, aircraft type limitations, retrofitability, implementation time, etc.). Highly ranked concepts will be evaluated using modeling and simulation to identify probabilities-of-effectiveness as compared to unprotected aircraft systems. The most promising vulnerability reduction concepts will be transitioned into an advanced development stage of the program. Modeling and ground-based vulnerability testing will be performed to determine the success of competing systems. Since World War II, the US has not fought an enemy with a significant offensive air capability. However, certain lessons can be gleaned from the experience of our opponents in the Vietnam War. **The most lucrative targets in the jungle are command and control nodes, logistical bases, and fire support sites.** Individual units are relatively more difficult to acquire and identify than fixed sites. Air defense assets, such as missiles and guns, should be used to protect fixed sites. At any rate, the rugged jungle terrain makes it nearly impossible to transport missiles and guns through the jungle. MANPADS and small arms fire should be used to protect maneuver units when passive air defense measures fail. The success of the NVA and Viet Cong in bringing down US CAS aircraft and helicopters is instructive. During movement, MANPADS should be positioned where they can best cover the unit. Due to the dense jungle vegetation, that may entail moving along a ridge line on the flank of the axis of advance, travelling down a waterway, or hopping from LZ to LZ. The Vietnam War proved that Small Arms for Air Defense (SAFAD) works in the jungle. It also proved that passive air defense methods work as well. Reviews of historical data show that many times NVA and Viet Cong units of up to regimental size were able to maneuver freely through the jungle without being detected. Superb route selection, march discipline, and effective camouflage were the keys. Most NVA and Viet Cong units that were badly mauled by CAS were either in contact with US ground forces,were crossing a danger area, or were using a road or trail. However, they almost invariably extracted a toll of downed CAS aircraft and helicopters using a combination of passive air defense and SAFAD techniques. The intelligence analysis of the threat to civil aviation is the basis for determining the application of aviation security measures. This is accomplished by synthesizing intelligence and threat information into products such as security programs, security directives, information circulars, and threat assessments. These products are needed by the operations and policy and planning offices for ruling on carrier amendments to approved security programs, determinations of foreign airport security effectiveness, and support in changing regulations. Decisions to impose additional security measures result from coordinated effort among operations, policy, and intelligence specialists, US and foreign air carriers, and airport operators. In 1990 the President's Commission on Aviation Security and Terrorism, formed in response to the bombing of Pan American Flight 103 over Lockerbie, Scotland, recommended that the FAA pursue an intensified program of research, development and deployment to counteract the terrorist threat to the civil aviation system. This mandate was embodied in the Aviation Security Improvement Act of 1990. In 1997, the White House Commission on Aviation Safety and Security noted that "The terrorist threat is changing and growing. Therefore, it is important to improve security not just against familiar threats, such as explosives in checked baggage, but also means of assessing and countering emerging threats."

Second internal link:

### Aerospace solves terrorism- CT operations detect, prevent and neutralize terrorist activities

USAF, 2k [United States Air Force, “Organization and Employment of Aerospace Power,” Air Force Doctrine Document 2, February 17, 2000, <http://www.iwar.org.uk/military/resources/aspc/pubs/afdd2.pdf>, DA 7/15/11]//RS

Counterterrorism Operations: Counterterrorism operations are p ro g r a m s d e s i g n e d to d e t e c t , prevent, or neutralize terrorist activities by identifying, targeting, and repressing individuals, groups, or organizations conducting or suspec ted of conduc t ing ter ror i s t activities. In 1986, Operation EL DORADO CANYON included air strikes against terrorist sites and encampments within Libya to dissuade Muammar Qaddafi from supporting international terrorism.

### Bioterrorism alone is recognized as the most severe risk for causing extinction

Matheny, 7 [Jason G. Matheny, “Reducing the Risk of Human Extinction,” December 7, 2007, Risk Analysis: Volume 27, Issue 5, pages 1335–1344, <http://onlinelibrary.wiley.com/doi/10.1111/j.1539-6924.2007.00960.x/full>, DA 7/16/11]//RS

Of current extinction risks, the most severe may be bioterrorism. The knowledge needed to engineer a virus is modest compared to that needed to build a nuclear weapon; the necessary equipment and materials are increasingly accessible and because biological agents are self-replicating, a weapon can have an exponential effect on a population (Warrick, 2006; Williams, 2006). 5 Current U.S. biodefense efforts are funded at $5 billion per year to develop and stockpile new drugs and vaccines, monitor biological agents and emerging diseases, and strengthen the capacities of local health systems to respond to pandemics (Lam, Franco, & Shuler, 2006). There is currently no independent body assessing the risks of high-energy physics experiments. Posner (2004) has recommended withdrawing federal support for such experiments because the benefits do not seem to be worth the risks.

### Nuclear terrorism is an existential threat—it escalates to nuclear war with Russia and China

Ayson, 10 [Robert Ayson, Professor of Strategic Studies and Director of the Centre for Strategic Studies: New Zealand at the Victoria University of Wellington, “After a Terrorist Nuclear Attack: Envisaging Catalytic Effects,” Studies in Conflict & Terrorism, Volume 33, Issue 7, July 2010, DA 7/16/11]

A terrorist nuclear attack, and even the use of nuclear weapons in response by the country attacked in the first place, would not necessarily represent the worst of the nuclear worlds imaginable. Indeed, there are reasons to wonder whether nuclear terrorism should ever be regarded as belonging in the category of truly existential threats. A contrast can be drawn here with the global catastrophe that would come from a massive nuclear exchange between two or more of the sovereign states that possess these weapons in significant numbers. Even the worst terrorism that the twenty-first century might bring would fade into insignificance alongside considerations of what a general nuclear war would have wrought in the Cold War period. And it must be admitted that as long as the major nuclear weapons states have hundreds and even thousands of nuclear weapons at their disposal, there is always the possibility of a truly awful nuclear exchange taking place precipitated entirely by state possessors themselves. But these two nuclear worlds—a non-state actor nuclear attack and a catastrophic interstate nuclear exchange—are not necessarily separable. It is just possible that some sort of terrorist attack, and especially an act of nuclear terrorism, could precipitate a chain of events leading to a massive exchange of nuclear weapons between two or more of the states that possess them. In this context, today’s and tomorrow’s terrorist groups might assume the place allotted during the early Cold War years to new state possessors of small nuclear arsenals who were seen as raising the risks of a catalytic nuclear war between the superpowers started by third parties. These risks were considered in the late 1950s and early 1960s as concerns grew about nuclear proliferation, the so-called n+1 problem. It may require a considerable amount of imagination to depict an especially plausible situation where an act of nuclear terrorism could lead to such a massive inter-state nuclear war. For example, in the event of a terrorist nuclear attack on the United States, it might well be wondered just how Russia and/or China could plausibly be brought into the picture, not least because they seem unlikely to be fingered as the most obvious state sponsors or encouragers of terrorist groups. They would seem far too responsible to be involved in supporting that sort of terrorist behavior that could just as easily threaten them as well. Some possibilities, however remote, do suggest themselves. For example, how might the United States react if it was thought or discovered that the fissile material used in the act of nuclear terrorism had come from Russian stocks and if for some reason Moscow denied any responsibility for nuclear laxity? The correct attribution of that nuclear material to a particular country might not be a case of science fiction given the observation by Michael May et al. that while the debris resulting from a nuclear explosion would be “spread over a wide area in tiny fragments, its radioactivity makes it detectable, identifiable and collectable, and a wealth of information can be obtained from its analysis: the efficiency of the explosion, the materials used and, most important … some indication of where the nuclear material came from.”41 Alternatively, if the act of nuclear terrorism came as a complete surprise, and American officials refused to believe that a terrorist group was fully responsible (or responsible at all) suspicion would shift immediately to state possessors. Ruling out Western ally countries like the United Kingdom and France, and probably Israel and India as well, authorities in Washington would be left with a very short list consisting of North Korea, perhaps Iran if its program continues, and possibly Pakistan. But at what stage would Russia and China be definitely ruled out in this high stakes game of nuclear Cluedo? In particular, if the act of nuclear terrorism occurred against a backdrop of existing tension in Washington’s relations with Russia and/or China, and at a time when threats had already been traded between these major powers, would officials and political leaders not be tempted to assume the worst? Of course, the chances of this occurring would only seem to increase if the United States was already involved in some sort of limited armed conflict with Russia and/or China, or if they were confronting each other from a distance in a proxy war, as unlikely as these developments may seem at the present time. The reverse might well apply too: should a nuclear terrorist attack occur in Russia or China during a period of heightened tension or even limited conflict with the United States, could Moscow and Beijing resist the pressures that might rise domestically to consider the United States as a possible perpetrator or encourager of the attack? **Washington’s early response to a terrorist nuclear attack on its own soil might also raise the possibility of an unwanted (and nuclear aided) confrontation with Russia and/or China**. For example, in the noise and confusion during the immediate aftermath of the terrorist nuclear attack, the U.S. president might be expected to place the country’s armed forces, including its nuclear arsenal, on a higher stage of alert. In such a tense environment, when careful planning runs up against the friction of reality, it is just possible that Moscow and/or China might mistakenly read this as a sign of U.S. intentions to use force (and possibly nuclear force) against them. In that situation, the temptations to preempt such actions might grow, although it must be admitted that any preemption would probably still meet with a devastating response. As part of its initial response to the act of nuclear terrorism (as discussed earlier) Washington might decide to order a significant conventional (or nuclear) retaliatory or disarming attack against the leadership of the terrorist group and/or states seen to support that group. Depending on the identity and especially the location of these targets, Russia and/or China might interpret such action as being far too close for their comfort, and potentially as an infringement on their spheres of influence and even on their sovereignty. One far-fetched but perhaps not impossible scenario might stem from a judgment in Washington that some of the main aiders and abetters of the terrorist action resided somewhere such as Chechnya, perhaps in connection with what Allison claims is the “Chechen insurgents’ … long-standing interest in all things nuclear.”42 American pressure on that part of the world would almost certainly raise alarms in Moscow that might require a degree of advanced consultation from Washington that the latter found itself unable or unwilling to provide. There is also the question of how other nuclear-armed states respond to the act of nuclear terrorism on another member of that special club. It could reasonably be expected that following a nuclear terrorist attack on the United States, both Russia and China would extend immediate sympathy and support to Washington and would work alongside the United States in the Security Council. But there is just a chance, albeit a slim one, where the support of Russia and/or China is less automatic in some cases than in others. For example, what would happen if the United States wished to discuss its right to retaliate against groups based in their territory? If, for some reason, Washington found the responses of Russia and China deeply underwhelming, (neither “for us or against us”) might it also suspect that they secretly were in cahoots with the group, increasing (again perhaps ever so slightly) the chances of a major exchange. If the terrorist group had some connections to groups in Russia and China, or existed in areas of the world over which Russia and China held sway, and if Washington felt that Moscow or Beijing were placing a curiously modest level of pressure on them, what conclusions might it then draw about their culpability? If Washington decided to use, or decided to threaten the use of, nuclear weapons, the responses of Russia and China would be crucial to the chances of avoiding a more serious nuclear exchange. They might surmise, for example, that while the act of nuclear terrorism was especially heinous and demanded a strong response, the response simply had to remain below the nuclear threshold. It would be one thing for a non-state actor to have broken the nuclear use taboo, but an entirely different thing for a state actor, and indeed the leading state in the international system, to do so. If Russia and China felt sufficiently strongly about that prospect, there is then the question of what options would lie open to them to dissuade the United States from such action: and as has been seen over the last several decades, the central dissuader of the use of nuclear weapons by states has been the threat of nuclear retaliation. If some readers find this simply too fanciful, and perhaps even offensive to contemplate, it may be informative to reverse the tables. Russia, which possesses an arsenal of thousands of nuclear warheads and that has been one of the two most important trustees of the non-use taboo, is subjected to an attack of nuclear terrorism. In response, Moscow places its nuclear forces very visibly on a higher state of alert and declares that it is considering the use of nuclear retaliation against the group and any of its state supporters. How would Washington view such a possibility? Would it really be keen to support Russia’s use of nuclear weapons, including outside Russia’s traditional sphere of influence? And if not, which seems quite plausible, what options would Washington have to communicate that displeasure? If China had been the victim of the nuclear terrorism and seemed likely to retaliate in kind, would the United States and Russia be happy to sit back and let this occur? In the charged atmosphere immediately after a nuclear terrorist attack, how would the attacked country respond to pressure from other major nuclear powers not to respond in kind? The phrase “how dare they tell us what to do” immediately springs to mind. Some might even go so far as to interpret this concern as a tacit form of sympathy or support for the terrorists. This might not help the chances of nuclear restraint.

### Terrorism causes extinction- exacerbates prolif, ethnic conflicts globally

Sid-Ahmed, 4 [Mohamed Sid-Ahmed, Political analyst, Managing Editor for Al-Abali, “Extinction!,” August 26-September 1, Issue: 705, <http://weekly.ahram.org.eg/2004/705/op5.htm>, DA 7/16/11]

What would be the consequences of a nuclear attack by terrorists? Even if it fails, it would further exacerbate the negative features of the new and frightening world in which we are now living. Societies would close in on themselves, police measures would be stepped up at the expense of human rights, tensions between civilisations and religions would rise and ethnic conflicts would proliferate. It would also speed up the arms race and develop the awareness that a different type of world order is imperative if humankind is to survive. But the still more critical scenario is if the attack succeeds. **This could lead to a third world war**, **from which no one will emerge victorious.** Unlike a conventional war which ends when one side triumphs over another, this war will be without winners and losers. When nuclear pollution infects the whole planet, we will all be losers.

### Terrorism risks extinction- evolving biological, chemical, and nuclear warfare increases the risk

Alexander, 3 [Yonah, professor and director of the Inter-University for Terrorism Studies, August 23, 2003, Washington Times, DA 7/16/11]

Last week's brutal suicide bombings in Baghdad and Jerusalem have once again illustrated dramatically that the international community failed, thus far at least, to understand the magnitude and implications of the terrorist threats to the very survival of civilization itself. Even the United States and Israel have for decades tended to regard terrorism as a mere tactical nuisance or irritant rather than a critical strategic challenge to their national security concerns. It is not surprising, therefore, that on September 11, 2001, Americans were stunned by the unprecedented tragedy of 19 al Qaeda terrorists striking a devastating blow at the center of the nation's commercial and military powers. Likewise, Israel and its citizens, despite the collapse of the Oslo Agreements of 1993 and numerous acts of terrorism triggered by the second intifada that began almost three years ago, are still "shocked" by each suicide attack at a time of intensive diplomatic efforts to revive the moribund peace process through the now revoked cease-fire arrangements [hudna]. Why are the United States and Israel, as well as scores of other countries affected by the universal nightmare of modern terrorism surprised by new terrorist "surprises"? There are many reasons, including misunderstanding of the manifold specific factors that contribute to terrorism's expansion, such as lack of a universal definition of terrorism, the religionization of politics, double standards of morality, weak punishment of terrorists, and the exploitation of the media by terrorist propaganda and psychological warfare. Unlike their historical counterparts, contemporary terrorists have introduced a new scale of violence in terms of conventional and unconventional threats and impact. The internationalization and brutalization of current and future terrorism make it clear we have entered an Age of Super Terrorism [e.g. biological, chemical, radiological, nuclear and cyber] with its serious implications concerning national, regional and global security concerns.

## AT Terrorism Bad Impact

### Terrorism is not an existential threat—their evidence is just hype.

Peña, 10 [Charles V. Peña, Senior Fellow at the Independent Institute, Senior Fellow with the Coalition for a Realistic Foreign Policy, former Senior Fellow with the George Washington University Homeland Security Policy Institute and Former Director of Defense Policy Studies at the Cato Institute, Adviser to the Straus Military Reform Project, Analyst for MSNBC television, holds an M.A. in Security Studies from George Washington University, “Better Safe Than Sorry?,” Antiwar.com, September 30th, 2010, http://original.antiwar.com/pena/2010/09/30/better-safe-than-sorry/print/]

In the post-9/11 world, “better safe than sorry” has become an article of faith guiding the actions we take in the name of preventing terrorism. But are we truly better safe than sorry? To begin, the main reason so many people are willing to accept “better safe than sorry” is because they believe the consequences are too terrible to act otherwise. In other words, we should be willing to do almost anything to prevent another terrorist attack. Although another terrorist attack on the scale of 9/11 – which killed some 3,000 people – would be a great catastrophe and tragedy, it would not be an end-of-the-world event. As a nation, we survived 9/11, and we would (or at least we should) survive if there was another 9/11. That is not to trivialize or marginalize the people killed by the 9/11 attacks (or who would be killed in any future terrorist attacks), but it’s important to understand that terrorism is not an existential threat – otherwise, our responses are disproportionate (in magnitude or cost, or both) to the actual threat. It’s hard to be dispassionate because of the emotionalism surrounding 9/11, but here are some numbers worth considering to put “better safe than sorry” in context when it comes to terrorism. According to the Global Terrorism Database, from 1970 through 2007, there have been 1,347 terrorist incidents in the United States resulting in 3,340 fatalities (2,949 of which were on 9/11) and 2,234 injuries. That’s less than 100 fatalities per year on average (and more like 10 if you exclude 9/11 as an extraordinary event). By way of comparison, consider these 2006 fatality statistics from the the Centers for Disease Control: \* Unintentional fall deaths: 20,853 \* Motor vehicle traffic deaths: 43,646 \* Unintentional poisoning deaths: 27,531 \* Homicides: 18,573 \* Firearms homicides: 12,791 Put another way, **far more people die in a single year from other causes than have died as result of terrorism over a span of more than 35 years.** Yet we have a Chicken Little attitude that the sky is falling when it comes to the potential threat of terrorism.

## Heg Impact

### U.S. Air power key to heg- empirically proven in Desert Storm

Posen, 3 [Barry R. Posen is Professor of Political Science at the Massachusetts Institute of Technology and a member of its Security Studies Program, “Command of the Commons: The Military Foundation of U.S. Hegemony,” International Security, Volume 28, Number 1, Summer 2003, pp.

5-46 (Article), <http://muse.jhu.edu/journals/international_security/v028/28.1posen.html>, DA 7/16/11]//RS

Command of the Air An electronic flying circus of specialized attack, jamming, and electronic intelligence aircraft allows the U.S military to achieve the "suppression of enemy air defenses" (SEAD); limit the effectiveness of enemy radars, surface-to-air missiles (SAMs) and fighters; and achieve the relatively safe exploitation of enemy skies above 15,000 feet. 37 Cheap and simple air defense weapons, such as antiaircraft guns and shoulder-fired lightweight SAMs, are largely ineffective at these altitudes. Yet at these altitudes aircraft can deliver precision-guided munitions with great accuracy and lethality, if targets have been properly located and identified. The ability of the U.S. military to satisfy these latter two conditions varies with the nature of the targets, the operational circumstances, and the available reconnaissance and command and control assets (as discussed below), so precision-guided munitions are not a solution to every problem. The United States has devoted increasing effort to modern aerial reconnaissance capabilities, including both aircraft and drones, which have improved the military's ability in particular to employ air power against ground forces, but these assets still do not provide perfect, instantaneous information. 38 Confidence in the quality of their intelligence, and the lethality and responsiveness of their air power, permitted U.S. commanders to dispatch relatively small numbers of ground forces deep into Iraq in the early days of the 2003 war, without much concern for counterattacks by large Iraqi army units. 39 The U.S. military maintains a vast stockpile of precision-guided munitions and is adding to it. As of 1995, the Pentagon had purchased nearly 120,000 air-launched precision-guided weapons for land and naval attack at a cost of $18 billion. 40 Some 20,000 of these weapons were high-speed antiradiation missiles [End Page 15] (HARMs), designed to home in on the radar emissions of ground-based SAM systems, a key weapon for the SEAD campaign. Thousands of these bombs and missiles were launched in Kosovo, Afghanistan, and Iraq, but tens of thousands more have been ordered. 41 The capability for precision attack at great range gives the United States an ability to do significant damage to the infrastructure and the forces of an adversary, while that adversary can do little to harm U.S. forces. 42 Air power alone may not be able to determine the outcome of all wars, but it is a very significant asset. Moreover, U.S. air power has proven particularly devastating to mechanized ground forces operating offensively, as was discovered in the only Iraqi mechanized offensive in Desert Storm, the battle of al-Khafji, in which coalition air forces pummeled three advancing Iraqi divisions. 43 The United States can provide unparalleled assistance to any state that fears a conventional invasion, making it a very valuable ally.

### Aerospace vital to heg- All combat operations and infrastructure require aerospace to function

USAF, 2k [United States Air Force, “Organization and Employment of Aerospace Power,” Air Force Doctrine Document 2, February 17, 2000, <http://www.iwar.org.uk/military/resources/aspc/pubs/afdd2.pdf>, DA 7/15/11]//RS

In the strategic sense, aerospace power conducts maneuver through global mobility and global attack. At this level of war, maneuver concerns such issues as ASETF deployment, over flight rights, intertheater airlift, and orbital access. Command and control of such globally deployed aerospace power is also involved. A theater CINC positioning forces so operational commanders can use them to greatest possible effect exemplifies strategic maneuver. This positioning includes not only the combat forces themselves, but also **all of the combat support and infrastructure required for them to function**. In simple terms, strategic maneuver involves deployment while operational and tactical maneuver concerns employment. Some missions can involve all three types of maneuver, such as when a deploying unit drops munitions en route to its deployed location or when a long-range bomber departs its CONUS home station, drops ordnance on a distant target, and returns. Tactical maneuver is the most readily recognized form of maneuver and involves individual platforms using three-dimensional movements through air or space to accomplish specific tasks. Examples include a fighter maneuvering to its opponent’s six o’clock position for a gun kill, a bomber using terrain masking while inbound to the target, or a reconnaissance satellite performing an orbital plane change to overfly a desired point of interest. In these cases, aerospace assets use their common advantage of three-dimensional maneuver to achieve an advantage in the battlespace. While tactical maneuver emphasizes such technological measures of performance as “g-available” and “delta-v,” tactical superiority only counts when it can be turned into an operational or strategic advantage.

### Aerospace is key to heg- allows for effective and rapid attack

USAF, 2k [United States Air Force, “Organization and Employment of Aerospace Power,” Air Force Doctrine Document 2, February 17, 2000, <http://www.iwar.org.uk/military/resources/aspc/pubs/afdd2.pdf>, DA 7/15/11]//RS

Aerospace power is usually employed to greatest effect in parallel, asymmetric operations. This includes precision strikes against surface forces, information attack against command and control systems, or precision strikes against infrastructure and COGs. Asymmetric attack uses the speed and range of aerospace power, coupled with its threedimensional advantage, to strike the enemy where it hurts the most. Symmetric force-on-force warfare is sometimes required, such as the air-to-air combat often associated with achieving air superiority. At the beginning of a conflict, other offensive operations can sometimes be accomplished in parallel with counterair operations. If the enemy strongly challenges our air superiority, we may be forced into serial operations in which all available assets must be dedicated to winning air superiority before any offensive operations other than counterair attack missions are flown. In general terms, experience has shown that parallel and asymmetric operations are more effective, achieve results faster, and are less costly than symmetric or serial operations. Today, precision engagement and increased intelligence capabilities allow simultaneous and rapid attack on key nodes and forces, producing a cumulative effect that overwhelms the enemy’s capacity to recover. As a result, the effects of parallel operations are achieved quickly and are likely to be decisive. In addition to the physical destruction from parallel operations, the shock and surprise of such attacks, coupled with the uncertainty of when or where the next blow will fall, can lead to serious morale effects on the enemy. Commanders should consider these facts when deciding how best to employ aerospace power at the theater level.

### Aerospace is vital to heg- laundry list

USAF, 2k [United States Air Force, “Organization and Employment of Aerospace Power,” Air Force Doctrine Document 2, February 17, 2000, <http://www.iwar.org.uk/military/resources/aspc/pubs/afdd2.pdf>, DA 7/15/11]//RS

Aerospace power can be instrumental to success in this phase of operations. Aerospace forces can assist in locating and removing unexploded ordnance. They can help locate pockets of enemy resistance and, if necessary, neutralize the threat. The same information gained during the combat research phase of campaign planning can be used to identify those social, economic, political, and cultural factors that may require posthostilities attention. This data, combined with the intelligence gathered during the conflict, can be used to identify and apply required national assistance or military influence to stabilize the postconflict environment. Aerospace forces can provide intelligence, airlift, and humanitarian assistance; help restore basic infrastructure; provide transportation, communications, and information support; and provide other assistance required by military, international, regional, and private organizations. Aerospace forces can directly support treaty compliance and verification. Military operations may vary from establishing a12 military government (e.g., post-World War II Japan), conducting civil affairs (e.g., post-JUST CAUSE in Panama), performing aerial occupation (e.g., no-fly zones in Iraq), conducting humanitarian operations (e.g., PROVIDE COMFORT in Turkey), to cooperating with a myriad governmental and nongovernmental organizations. The nature of the operation and the required military support will be decided by the objectives of the NCA. Finally, the redeployment of forces should be planned to provide for an orderly, well-defended withdrawal once the required objectives are met. Whether conflict termination is imposed by decisive military victory or through a negotiated settlement, aerospace forces play a critical role in any posthostility transition as they offer global and theaterwide capabilities. Since aerospace forces offer national leaders a potent force to support political and economic instruments of national power during posthostilities, COMAFFORs must clearly and explicitly define the capabilities of their respective forces to meet the objectives of conflict termination.

## Democracy Impact

### Aerospace solves democracy- its key to National Security Strategy which promotes peacekeeping

USAF, 2k [United States Air Force, “Organization and Employment of Aerospace Power,” Air Force Doctrine Document 2, February 17, 2000, <http://www.iwar.org.uk/military/resources/aspc/pubs/afdd2.pdf>, DA 7/15/11]//RS

Peacetime engagement anchors aerospace power to the basic objectives of the National Security Strategy—protecting the nation and its vital interests. A key aim of this strategy is the promotion of long-term international stability. Stability, in turn, establishes conditions necessary for promoting continued democratic development worldwide. Such development is fostered by maintaining permanent overseas presence, participating in combined and joint exercises, conducting aviation advisory assistance, and working with allies on security arrangements.

### Democracy solves extinction and all your impacts

Carnegie Commission, 95 [Carnegie Commission, October 1995, <http://wwics.si.edu/subsites/ccpdc/pubs/di/1.htm>, 7/16/11]

Nuclear, chemical, and biological weapons continue to proliferate. The very source of life on Earth, the global ecosystem, appears increasingly endangered. Most of these new and unconventional threats to security are associated with or aggravated by the weakness or absence of democracy, with its provisions for legality, accountability, popular sovereignty, and openness. The experience of this century offers important lessons. Countries that govern themselves in a truly democratic fashion do not go to war with one another. They do not aggress against their neighbors to aggrandize themselves or glorify their leaders. Democratic governments do not ethnically "cleanse" their own populations, and they are much less likely to face ethnic insurgency. Democracies do not sponsor terrorism against one another. They do not build weapons of mass destruction to use on or to threaten one another. Democratic countries form more reliable, open, and enduring trading partnerships. In the long run they offer better and more stable climates for investment. They are more environmentally responsible because they must answer to their own citizens, who organize to protest the destruction of their environments. They are better bets to honor international treaties since they value legal obligations and because their openness makes it much more difficult to breach agreements in secret. Precisely because, within their own borders, they respect competition, civil liberties, property rights, and the rule of law, democracies are the only reliable foundation on which a new world order of international security and prosperity can be built.

### Democracy solves extinction- Democratic nations must answer to their own citizens

Diamond, 95 [Larry Diamond, Hoover Institution, Stanford University, “Promoting Democracy in the 1990s,” December 1995, <http://www.carnegie.org//sub/pubs/deadly/diam_rpt.html>, DA 7/16/11]

Nuclear, chemical and biological weapons continue to proliferate. The very source of life on Earth, the global ecosystem, appears increasingly endangered. Most of these new and unconventional threats to security are associated with or aggravated by the weakness or absence of democracy, with its provisions for legality, accountability, popular sovereignty and openness. The experience of this century offers important lessons. **Countries that govern themselves in a truly democratic fashion do not go to war with one another.** They do not aggress against their neighbors to aggrandize themselves or glorify their leaders. Democratic governments do not ethnically "cleanse" their own populations, and they are much less likely to face ethnic insurgency. Democracies do not sponsor terrorism against one another. They do not build weapons of mass destruction to use on or to threaten one another. Democratic countries form more reliable, open, and enduring trading partnerships. In the long run they offer better and more stable climates for investment. They are more environmentally responsible because they must answer to their own citizens, who organize to protest the destruction of their environments.

## Disaster Relief & Humanitarian Aid

### Aerospace solves disaster relief operations & humanitarian aid- It supports ISR info systems

USAF, 2k [United States Air Force, “Organization and Employment of Aerospace Power,” Air Force Doctrine Document 2, February 17, 2000, <http://www.iwar.org.uk/military/resources/aspc/pubs/afdd2.pdf>, DA 7/15/11]//RS

Information systems provide timely and vital warning and monitoring of potential crises through intelligence, surveillance, and reconnaissance (ISR). Aerospace power provides a national response for13 safeguarding human life through evacuation, humanitarian assistance and disaster relief operations, or peacekeeping reinforcement when aggression or natural disasters cause physical destruction, privation, or hardship.

### Detecting volcanic eruptions early saves lives

Alexander, 91 [David Alexander, Department of Geography and Geology, University of Massachusetts at Amherst, Morrill Science Center, September 1991, <http://ppg.sagepub.com/content/15/3/238.short>, DA 7/16/11]

On 15 December 1989 a KLM Boeing 747 flew through the ash plume of Redoubt Volcano in Alaska, which was invisible to aviation radar and the pilots’ vision. Ingestion and fusion of ash particles increased turbine pressure and resulted in the loss of all engine power for 12 minutes in flight, and acid corrosion caused US$50 million of damage to the aircraft. Yet volcanic plumes can be detected by the Advanced Very High Resolution Radiometers (AVHRRs) carried aboard the American NOAA-10 and NOAA-11 satellites, which provide coverage of much of the earth every 12 hours. Clouds of volcanic ash appear on band 5 (11.5-12.5 pm) and at night on thermal infrared band 3 (3.5-3.93 JLm). Bands 4 and 5 together (10.3-12.5 >m) show up the contrast between normal cloud cover and clouds rich in ash particulates. Contrast can be enhanced by assigning ’false’ colour tones to particular ranges of values on the digital image. Real-time analysis is considered feasible, and could give data on the concentration and temperature of ash clouds, and their location, direction and speed of movement, all of which could be communicated to aviation authorities (Keinle et al., 1990). Weather satellites are proving extremely versatile in terms of rapid volcanic monitoring. The Total Ozone Mapping Spectrometer (TOMS) carried aboard Nimbus-7, for example, can use the 0.3-0.335 ¡.tm waveband to map the atmospheric distribution of sulphur dioxide emitted during eruptions. GOES satellites can give information on the changing location of ash plumes over time, while radar sensors, which respond to wavelengths of 3-70 cm, can monitor the volume and position of lava flows (Mouginis-Mark et al., 1989). At present, however, no operational radar satellites are in orbit: the first, to be launched by Canada in 1994, will use synthetic aperture radar to scan images 500 km wide at 100 m resolution and images 50 km wide at 8-10 m resolution (Zimmerman, 1989).

### Rapid preparedness for natural disasters can stop epidemics

Waring, 5 [Stephen Waring, DVM, PhD, is Associate Director, Center for Biosecurity and Public Health Preparedness, University of Texas School of Public Health at Houston. Bruce J. Brown, MPH, is Director, Environmental Health and Safety, Center for Biosecurity and Public Health Preparedness, University of Texas School of Public Health at Houston, April 12, 2005, “The Threat of Communicable Diseases Following Natural Disasters: A Public Health Response,” <http://www.sciencedirect.com/science/article/pii/S1540248705000040>, DA 7/16/11]

Natural disasters, such as the recent Indian Ocean tsunami, can have a rapid onset, broad impact, and produce many factors that work synergistically to increase the risk of morbidity and mortality caused by communicable diseases. The primary goal of emergency health interventions is to prevent epidemics and improve deteriorating health conditions among the population affected. Morbidity and mortality due to infectious diseases can be minimized providing these intervention efforts are implemented in a timely and coordinated fashion. This article presents a review of some of the major issues relevant to preparedness and response for natural disasters.

## Prolif Impact

### Aerospace solves prolif- Overflight verification reports each country’s testing or employment of weapon systems

USAF, 2k [United States Air Force, “Organization and Employment of Aerospace Power,” Air Force Doctrine Document 2, February 17, 2000, <http://www.iwar.org.uk/military/resources/aspc/pubs/afdd2.pdf>, DA 7/15/11]//RS

Arms Control Operations: Arms control operations limit and reduce the number and types of weapons threatening stability within a region. They encompass arms control verification that entails collecting, processing, and reporting of data indicating testing or employment of proscribed weapon systems, including country of origin and location, weapon and payload identification, and event type. The Open Skies Treaty, signed by 27 nations in 1992, allows overflight verification of each country’s conventional military posture and confirms that signatory nations are in compliance with the Conventional Forces in Europe Treaty.

### Proliferation causes extinction- small scaled conflicts have a greater risk of escalating and going nuclear

Utgoff, 2 [Victor Utgoff, PhD, Deputy Director for the Strategy, Forces, & Resources Division of the Institute for Defense Analysis former senior member of the National Security Council staff PhD from Purdue University, Summer, Survival, Vol. 44 #2, P. 87-90, DA 7/16/11]

Widespread proliferation is likely to lead to an occasional shoot-out with nuclear weapons and that such shoot-outs will have a substantial probability of escalating to the maximum destruction possible with the weapons at hand. Unless nuclear proliferation is stopped, we are headed toward a world that will mirror the American Wild West of the late 1800s. With most, if not all, nations wearing nuclear "six-shooters" on their hips, the world may even be a more polite place than it is today, but every once in a while we will all gather on a hill to bury the bodies of dead cities or even whole nations

### Proliferation risks global nuclear war and extinction

Krieger ‘9[David Krieger, Pres. Nuclear Age Peace Foundation and Councilor of World Future Council, “Still Loving the Bomb After All These Years,” September 4, 2009, <https://www.wagingpeace.org/articles/2009/09/04_krieger_newsweek_response.php?krieger>, DA 7/16/11]

Jonathan Tepperman’s article in the September 7, 2009 issue of Newsweek, “Why Obama Should Learn to Love the Bomb,” provides a novel but frivolous argument that nuclear weapons “may not, in fact, make the world more dangerous….” Rather, in Tepperman’s world, “The bomb may actually make us safer.” Tepperman shares this world with Kenneth Waltz, a University of California professor emeritus of political science, who Tepperman describes as “the leading ‘nuclear optimist.’” Waltz expresses his optimism in this way: “We’ve now had 64 years of experience since Hiroshima. It’s striking and against all historical precedent that for that substantial period, there has not been any war among nuclear states.” Actually, there were a number of proxy wars between nuclear weapons states, such as those in Korea, Vietnam and Afghanistan, and some near disasters, the most notable being the 1962 Cuban Missile Crisis. Waltz’s logic is akin to observing a man falling from a high rise building, and noting that he had already fallen for 64 floors without anything bad happening to him, and concluding that so far it looked so good that others should try it. Dangerous logic! Tepperman builds upon Waltz’s logic, and concludes “that all states are rational,” even though their leaders may have a lot of bad qualities, including being “stupid, petty, venal, even evil….” He asks us to trust that rationality will always prevail when there is a risk of nuclear retaliation, because these weapons make “the costs of war obvious, inevitable, and unacceptable.” Actually, he is asking us to do more than trust in the rationality of leaders; he is asking us to gamble the future on this proposition. “The iron logic of deterrence and mutually assured destruction is so compelling,” Tepperman argues, “it’s led to what’s known as the nuclear peace….” But if this is a peace worthy of the name, which it isn’t, it certainly is not one on which to risk the future of civilization. One irrational leader with control over a nuclear arsenal could start a nuclear conflagration, resulting in a global Hiroshima. Tepperman celebrates “the iron logic of deterrence,” but deterrence is a theory that is far from rooted in “iron logic.” It is a theory based upon threats that must be effectively communicated and believed. Leaders of Country A with nuclear weapons must communicate to other countries (B, C, etc.) the conditions under which A will retaliate with nuclear weapons. The leaders of the other countries must understand and believe the threat from Country A will, in fact, be carried out. The longer that nuclear weapons are not used, the more other countries may come to believe that they can challenge Country A with impunity from nuclear retaliation. The more that Country A bullies other countries, the greater the incentive for these countries to develop their own nuclear arsenals. Deterrence is unstable and therefore precarious. Most of the countries in the world reject the argument, made most prominently by Kenneth Waltz, that the spread of nuclear weapons makes the world safer. These countries joined together in the Nuclear Non-Proliferation Treaty (NPT) to prevent the spread of nuclear weapons, but they never agreed to maintain indefinitely a system of nuclear apartheid in which some states possess nuclear weapons and others are prohibited from doing so. The principal bargain of the NPT requires the five NPT nuclear weapons states (US, Russia, UK, France and China) to engage in good faith negotiations for nuclear disarmament, and the International Court of Justice interpreted this to mean complete nuclear disarmament in all its aspects. Tepperman seems to be arguing that seeking to prevent the proliferation of nuclear weapons is bad policy, and that nuclear weapons, because of their threat, make efforts at non-proliferation unnecessary and even unwise. If some additional states, including Iran, developed nuclear arsenals, he concludes that wouldn’t be so bad “given the way that bombs tend to mellow behavior.” Those who oppose Tepperman’s favorable disposition toward the bomb, he refers to as “nuclear pessimists.” These would be the people, and I would certainly be one of them, who see nuclear weapons as presenting an urgent danger to our security, our species and our future. Tepperman finds that when viewed from his “nuclear optimist” perspective, “nuclear weapons start to seem a lot less frightening.” “Nuclear peace,” he tells us, “rests on a scary bargain: you accept a small chance that something extremely bad will happen in exchange for a much bigger chance that something very bad – conventional war – won’t happen.” But the “extremely bad” thing he asks us to accept is the end of the human species. Yes, that would be serious. He also doesn’t make the case that in a world without nuclear weapons, the prospects of conventional war would increase dramatically. After all, it is only an unproven supposition that nuclear weapons have prevented wars, or would do so in the future. We have certainly come far too close to the precipice of catastrophic nuclear war. As an ultimate celebration of the faulty logic of deterrence, Tepperman calls for providing any nuclear weapons state with a “survivable second strike option.” Thus, he not only favors nuclear weapons, but finds the security of these weapons to trump human security. Presumably he would have President Obama providing new and secure nuclear weapons to North Korea, Pakistan and any other nuclear weapons states that come along so that they will feel secure enough not to use their weapons in a first-strike attack. Do we really want to bet the human future that Kim Jong-Il and his successors are more rational than Mr. Tepperman?

## Drug Trafficking Impact

### Aerospace solves drug trafficking- operations provide surveillance and notification in arresting drug traffickers

USAF, 2k [United States Air Force, “Organization and Employment of Aerospace Power,” Air Force Doctrine Document 2, February 17, 2000, <http://www.iwar.org.uk/military/resources/aspc/pubs/afdd2.pdf>, DA 7/15/11]//RS

Counterdrug Operations: Counterdrug operations are those active measures taken in close cooperation with law enforcement agencies to detect, monitor, and counter the production, trafficking, and use of illegal drugs. Military aerospace and intelligence operations continue to aid law enforcement agencies by providing surveillance, notification, and assistance in apprehending drug traffickers attempting to penetrate US borders.

Drug trafficking causes AIDS

Dupont,1 [Alan Dupont, Director of Asia-Pacific security program at the Australian National University’s Strategic and Defense Studies Centre, “HIV/AIDS: A Major International Security Issue,” 2001, [www.ausaid.gov.au/publications/pdf/security.pdf](http://www.ausaid.gov.au/publications/pdf/security.pdf), DA 7/16/11]

HIV/AIDS flourishes in conditions that are conducive to war and conflict. If HIV continues to proliferate, as seems likely, the virus will threaten the national security interests of afflicted states, the region’s collective security interests, and the lives of millions of people. States weakened by HIV/AIDS could become a significant source of regional instability — creating anxieties that they may facilitate the spread of the disease, drugs and organised crime into neighbouring countries**.** AlthoughHIV**/**AIDS would exist without crime, narcotics traffickingand the sex trade, these activitieshave been critical to its spread. As rates of heroin use increase, unprotected sex between injecting drug users and their partners — who may include sex workers — facilitates HIV transmission. HIV/AIDS–ravaged countries become evermore vulnerable to the predations oforganised crime and the cycle intensifiesas it is repeated.

### Drug trafficking supports terrorism

DEA, 2 [2002, <http://www.dea.gov/pubs/intel/02039/02039.html>, DA 7/16/11]

Terrorist organizations use a number of sources to garner funds for their activities, such as petty crimes, kidnap-for-ransom, charities, sympathizers, front companies, and drug trafficking. Most of the known terrorist organizations use several of these methods to collect funding, while preferring particular methods to others. Drug trafficking is among the most profitable sources. According to the Office of National Drug Control Policy (ONDCP), Americans alone spend an estimated $64 billion on illegal drugs annually. Drug trafficking has always been a profitable means for criminal organizations to further or fund their activities. The complicity of terrorist groups in drug trafficking varies from group to group and region to region. In the broadest sense, some terrorist groups may be involved in all aspects of the drug trade, form cultivation**,** production, transportation, and wholesale distribution to money laundering. These groups may also provide security for drug traffickerstransporting their product through territory controlled by terrorist organizations or their supporters. Finally, in some cases, terrorist groups or their supporters may require a “tax”to be paid on illicit products., or passage through controlled territory**.** No matter which form it takes, or the level of involvement in drug trafficking, many terrorist groups are using drug money to fundtheir activities and perpetrate violence against governments and people around the world.

### Drug trafficking funds terrorism

McCraw, 2k [Steven McCraw, Deputy Assistant Director Investigative Services Division Federal Bureau of Investigation on Organized Crime, Drug Trafficking and Terrorist Acts, 2000, <http://www.fbi.gov/congress00/mccraw.htm>, DA 7/16/11]

The threat of terrorism to America continues worldwide. The increasingly prominent U.S. role in international peacekeeping, diplomacy and business has increased America’s visibility and vulnerability and encouraged increased levels of activities by terrorist groups. While there is no evidence of narco-terrorism within the United States, intelligence has revealed that some terrorist organizations, such as Columbia’s FARC, and to a lesser extent the National Liberation Army (ELN), support their activities through funds acquired as the result of their protection of drug traffickers or the distribution of drugs in Columbia. These terrorists also target U.S. interests in their country. For example, in January 1993, three U.S. missionaries were kidnapped from a village in Panama by members of the FARC and remain missing. In February of last year, three U.S. citizens who were working in Colombia were kidnapped by suspected members of the FARC. These Americans were later executed in Venezuela.

### Failing at stopping drug trafficking causes systemic death in the US

Comodeca, 3 [Lieutenant Colonel Thomas J. Comodeca, United States Army, “The Need For Special Operations Forces Involvement in the Andean Region’s Counter Drug Efforts,” April 7, 2003, <http://www.dtic.mil/cgibin/GetTRDoc?Location=U2&doc=GetTRDoc.pdf&AD=ADA415480>, DA 7/16/11]

US assistance provided by DOD effectively contributes to US strategy to curb the illicit drug production and trafficking of the region. Successful operations conducted by the governments of Colombia and other Andean Region countries against illegal drug production and drug trafficking resulted in a decrease in the amount of drugs reaching the US.The US assisted eradication efforts in Peru, Bolivia, and Colombia made an impact on the amount of drugs produced in all source countries. Although the US-assisted efforts have not achieved total elimination of drug crops, any reduction in the influx of illegal drugs into the US has the potential to save both lives of US citizens and money which is lost paying the large bill incurred due to the impact illegal drugs have upon the US. The US strives to enhance the counterdrug capabilities of the region and to reduce the impact of the narcotraffickers and the guerrilla forces operating in the region. By working towards accomplishing these objectives and reducing the flow of illegal drugs into the US**, t**he benefits of such a reduction can also be experienced within the borders of the US. It is undeniable that drug abuse and illegal drug trafficking are valid threats to the citizens of the US and have already imparted great damage upon the people and the social institutions of the country at a significant co**st**. The US incurs a large overall cost due to the country’s drug problem, and the US can ill afford to reduce their efforts fighting the illicit drug traffickers. If efforts are reduced, the costs to the US due to the illegal drug problem can only be expected to increase. Given the magnitude of the cost and the drug threat to the US population, it would seem illogical for DOD to reduce their efforts. Any decrease in efforts would magnify the detrimental effects the influx of illegal drugs has upon the US. 79

### Drug trafficking destroys democracy and global economies

BBC, 2 [British Broadcasting Corporation, July 31, 2002,

Addo-Kufuor saiddrug abuse and illicit trafficking are matters of global concern because they impinge on the stability of nations as trafficking cartels undermine the sovereignty of governments, weaken and distort national economies through the operation of large debilitating black markets and generate serious domestic violence often with fatal consequences.

## Disease Scenario

### Specifically the biotech industry is k/t prevent disease spread- discovery of salmonella vaccine proves

NASA Academy, 8 [NASA Academy, researchers in aeronautics and space, “Roadmap to a Space Faring Civilization,” August 2008, <http://commercialspace.pbworks.com/f/NA08_GSFC_RSFC_VER_1.0.pdf>, DA 7/20/11]//RS

Specifically the biotech industry performs rapid research and produces many of products, continuously moving to the next big market or new drug. With their high profits and desire to expand, biotech companies have taken great interest in space research, which may prove to be a gold mine for the first company willing to take it seriously. Since its beginning, the International Space Station (ISS) has been seen as a great opportunity for biotech companies to perform research in zero-gravity environments. Scientists and businessman alike, all anticipating access to the station, have been frustrated by the lack of time they have been permitted to use it. In 2005, the ISS was named a national lab, yet it remains to be extremely underutilized. Noting the intrinsic value of an orbital laboratory, biotech may be ready to advance its markets into space. The most notable recent success has an experiment performed by SPACEHAB, a space company aimed at extending space based products to the consumer market. On May 30, 2008, SPACEHAB, signed a Space Act agreement with NASA, making them one of the first commercial groups to have access to the station and guaranteeing them space on all but one of the remaining shuttle flights (44). Thomas Pickens III, CEO of SPACEHAB, stated that this ―is expected to revolutionize a myriad of industries,‖ and ―will have a significant social and economic impact and shows great promise of saving lives and providing thousands of new jobs in the coming years" (45). That sentiment, shared by many throughout the biotech and other industries, has become one step closer to reality. SPACEHAB‘s recent agreement with NASA comes after successfully testing a salmonella vaccine aboard the ISS during STS-123 in March 2008. The Texas-based company flew tests again onboard STS-124, validating the previous results, leaving SPACEHAB with a vaccine which they will present to the Food and Drug Administration, hopefully start human tests as early as October (44), and market the vaccine in the next 2 to 3 years (46). SPACEHAB saw the potential market and have demonstrated promising results. Salmonella, chosen as a test case long before the most recent outbreaks, is the most common food poisoning agent in the United States. It affects over 40,000 people per year and is responsible for a loss of productivity valued at billions of dollars annually (47). According to the Center for Disease control, 400 people a year die of acute salmonellosis (48). Salmonella diarrhea is also one of the top 3 causes of infant mortality worldwide. Due to its widespread affects and previous experiments that showed salmonella was more virulent in microgravity, SPACEHAB targeted this vaccine as one that could prove the concept of vaccine development in space.

## Deterrence Impact

### Aerospace is key to deterrence & deescalate high-level conflict- information assets provide monitoring and missile launch warnings

USAF, 2k [United States Air Force, “Organization and Employment of Aerospace Power,” Air Force Doctrine Document 2, February 17, 2000, <http://www.iwar.org.uk/military/resources/aspc/pubs/afdd2.pdf>, DA 7/15/11]//RS

Deterrence and Contingency Actions: Aerospace power provides the nation with a rapid and responsive global force to deter aggression or prevent conflicts from escalating to higher levels of aggression. Aerospace forces provide both attack capability and support to deterrence through the potential use of overwhelming force. Information assets provide monitoring and warning of potential threats through such capabilities as standoff airborne and overhead reconnaissance and missile launch warning. These capabilities, and the knowledge by a potential aggressor that we have such capabilities, **are vital to deterrence**. All facets of aerospace power may come into play during contingency actions, which can vary from maintaining an existing peace to intervening in an active conflict to impose peace on warring factions.

### Deterrence reduces the likelihood of nuclear use- empirics and new countries show restraint

Alagappa, 9 [Muthiah Alagappa, Distinguished Senior Fellow, East-West Center PhD, International Affairs, Fletcher School of Law and Diplomacy, Tufts University,  “Reinforcing National Security and Regional Stability The Implications if Nuclear Weapons and Strategies,” The Long Shadow, pp. 514, 2009]

Second, the new states recognize the revolutionary nature of nuclear weapons; they are not immune to the strategic logic of these weapons. They have not behaved differently from the "rational" Western states. Just like the United States, Russia, Britain, and France, "new" countries see nuclear weapons as being useful in a deterrence role. They are in the process of developing more survivable forces but doing it responsibly in the context of other national priorities, avoiding intense arms competition that characterized the interaction of the advanced countries during the Cold War. Some new nuclear weapon states have attempted offensive strategies in the employment of nuclear weapons, but this attempt is not peculiar to them. The United States is in the forefront in developing offensive and strategic defense capabilities that some Asian states consider destabilizing. Third, the claim that so-called rogue states cannot be deterred does not withstand scrutiny. The Soviet Union was a revolutionary state seeking to fundamentally transform the international order. Yet deterrence was the primary nuclear strategy in dealing with that country. Deterrence was also the strategy against a China that under Mao was deemed a rogue and irrational state, especially during the Cultural Revolution. Characterization of China as a revolutionary state also did not stop the United States from negotiating with Mao and forming a strategic alignment with that country against the Soviet Union. Despite the claim that rogue states cannot be deterred, deterrence (conventional and nuclear) has been and continues to be the primary U.S. strategy against North Korea. The United States is now negotiating with a regime that it labels as irrational and tyrannical in an effort to freeze and eliminate North Korea's nuclear weapon capability. Certain frustrated arms controllers in the United States now attempt to depict India, the world's largest democracy and the fourth or fifth largest economy in terms of purchasing power parity, as a rogue state, although the Bush administration through its bilateral deal with India is seeking to bring that country into the formal nuclear order. The ongoing debate in Asia over the pros and cons of   a first-use policy is not much different from that in the Atlantic alliance during the Cold War or that in post-Cold War Russia. The point here is that the nuclear behavior of non-Western states is not substantively different from that of Western ones. Further, a country like the United States, which has a formidable nuclear arsenal, can deter them. I now turn to supporting my claim that nuclear weapons have contributed to security and stability in Asia.

### Deterrence solves nuclear war

Robinson, 1 [Paul C. Robinson, president and director of the Department of Energy Sandia National Laboratories, “A White Paper: Pursuing a New Nuclear Weapons Policy for the 21st Century,” <http://www.nukewatch.org/importantdocs/resources/pursuing_a_new_nuclear_weapons_p.html>, DA 7/16/11]

I served as an arms negotiator on the last two agreements before the dissolution of the Soviet Union and have spent most of my career enmeshed in the complexity of nuclear weapons issues on the government side of the table. It is abundantly clear (to me) that formulating a new nuclear weapons policy for the start of the 21st Century will be a most difficult undertaking. While the often over-simplified picture of deterrence during the Cold War—two behemoths armed to the teeth, staring each other down—has thankfully retreated into history, there are nevertheless huge arsenals of nuclear weapons and delivery systems, all in quite usable states, that could be brought back quickly to their Cold War postures. Additionally, throughout the Cold War and ever since, there has been a steady proliferation of nuclear weapons and other weapons of mass destruction by other nations around the globe. The vast majority of these newly armed states are not U.S. allies, and some already are exhibiting hostile behaviors, while others have the potential to become aggressors toward the U.S., our allies, and our international interests. Russia has already begun to emphasize the importance of its arsenal of nuclear weapons to compensate for its limited conventional capabilities to deal with hostilities that appear to be increasing along its borders. It seems inescapable that the U.S. must carefully think through how we should be preparing to deal with new threats from other corners of the world, including the role that nuclear weapons might serve in deterring these threats from ever reaching actual aggressions. I personally see the abolition of nuclear weapons as an impractical dream in any foreseeable future. I came to this view from several directions. The first is the impossibility of ever “uninventing” or erasing from the human mind the knowledge of how to build such weapons. While the sudden appearance of a few tens of nuclear weapons causes only a small stir in a world where several thousands of such weapons already exist, their appearance in a world without nuclear weapons would produce huge effects. (The impact of the first two weapons in ending World War II should be a sufficient example.) I believe that the words of Winston Churchill, as quoted by Margaret Thatcher to a special joint session of the U.S. Congress on February 20, 1985, remain convincing on this point: “Be careful above all things not to let go of the atomic weapon until you are sure, and more sure than sure, that other means of preserving the peace are in your hands.” Similarly, it is my sincere view that the majority of the nations who have now acquired arsenals of nuclear weapons believe them to be such potent tools for deterring conflicts that they would never surrender them**.** Against this backdrop, I recently began to worry that because there were few public statements by U.S. officials in reaffirming the unique role which nuclear weapons play in ensuring U.S. and world security, far too many people (including many in our own armed forces) were beginning to believe that perhaps nuclear weapons no longer had value. It seemed to me that it was time for someone to step forward and articulate the other side of these issues for the public: first, that nuclear weapons remain of vital importance to the security of the U.S. and to our allies and friends(today and for the near future); and second, that nuclear weapons will likely have an enduring role in preserving the peace and preventing world wars for the foreseeable future. These are my purposes in writing this paper. For the past eight years, I have served several Commanders-in-Chief of the U.S. Strategic Command by chairing the Policy Subcommittee of the Strategic Advisory Group (SAG). This group was asked to help develop a new terms of reference for nuclear strategy in the post-Cold War world. This paper draws on many of the discussions with my SAG colleagues (although one must not assume their endorsement of all of the ideas presented here). We addressed how nuclear deterrence might be extended—not just to deter Russia—but how it might serve a continuing role in deterring wider acts of aggression from any corner of the world, including deterring the use of nuclear, chemical or biological weapons. [Taken together, these are normally referred to as Weapons of Mass Destruction (WMD).] My approach here will be to: (1) examine what might be the appropriate roles for nuclear weapons for the future, (2) propose some new approaches to developing nuclear strategies and policies that are more appropriate for the post-Cold War world, and (3) consider the kinds of military systems and nuclear weapons that would be needed to match those policies. The Role(s) of Nuclear Weapons The Commander-in-Chief of the Strategic Command, Admiral Rich Mies, succinctly reflected the current U.S. deterrent policy last year in testimony to the U.S. Senate: “Deterrence of aggression is a cornerstone of our national security strategy, and strategic nuclear forces serve as the most visible and most important element of our commitment **Š (**further**)** deterrence of major military attack on the United States and its allies, particularly attacks involving weapons of mass destruction, remains our highest defense priority**.”** While the application of this policy seemed clear, perhaps we could have said even “straightforward,” during the Cold War; application of that policy becomes even more complicated if we consider applying it to any nation other than Russia. Let me first stress that nuclear arms must never be thought of as a single “cure-all” for security concerns. For the past 20 years, only 10 percent of the U.S. defense budget has been spent on nuclear forces. The other 90 percent is for “war fighting” capabilities. Indeed, conflicts have continued to break out every few years in various regions of the globe, and these nonnuclear capabilities have been regularly employed. By contrast, we have not used nuclear weapons in conflict since World War II. This is an important distinction for us to emphasize as an element of U.S. defense policy, and one not well understood by the public at large. Nuclear weapons must never be considered as war fighting tools. Rather we should rely on the catastrophic nature of nuclear weapons to achieve war prevention, to prevent a conflict from escalating **(**e.g., to the use of weapons of mass destruction), or to help achieve war termination when it cannot be achieved by other means, e.g., if the enemy has already escalated the conflict through the use of weapons of mass destruction. Conventional armaments and forces will remain the backbone of U.S. defense forces, but the inherent threat to escalate to nuclear use can help to prevent conflicts from ever starting, can prevent their escalation, as well as bring these conflicts to a swift and certain end. In contrast to the situation facing Russia, I believe we cannot place an over-reliance on nuclear weapons, but that we must maintain adequate conventional capabilities to manage regional conflicts in any part of the world. Noting that the U.S. has always considered nuclear weapons as “weapons of last resort,” we need to give constant attention to improving conventional munitions in order to raise the threshold for which we would ever consider nuclear use. It is just as important for our policy makers to understand these interfaces as it is for our commanders. Defenses Although it is beyond the scope of this paper to strictly consider “defensive” tactics and armaments, I believe it is important for the United States to consider a continuum of defensive capabilities, from boost phase intercept to terminal defenses. Defenses have always been an important element of war fighting, and are likely to be so when defending against missiles. Defenses will also provide value in deterring conflicts or limiting escalations. Moreover, the existence of a credible defense to blunt attacks by armaments emanating from a rogue state could well eliminate that rogue nation’s ability to dissuade the U.S. from taking military actions. If any attack against the U.S., its allies, or its forces should be undertaken with nuclear weapons or other weapons of mass destruction, there should be no doubt in the attacker’s mind that the United States might retaliate for such an attack with nuclear weapons; but the choice would be in our hands.

### Deterrence stops conflict escalation

Global Security Organization, 5 [Global Security Organization, “Military: Force Projection,” April 27, 2005, <http://www.globalsecurity.org/military/library/policy/army/fm/100-7/f1007_11.htm>, DA 7/16/11]

Deterrence is preferable to war. Effective deterrence can prevent escalation of a crisis. Deterrent action can resolve a crisis on favorable terms. When the opportunity exists, the use of a deterrent action, such as a show of force, can send a clear signal of US resolve to intervene should the threat of unfavorable crisis resolution continue.

### Deterrence Stops Conflicts

AIDD, 10 [Acronym Institute for Disarmament Diplomacy, “Nuclear weapons and deterrence: Questioning the “indispensable” relationship,” 2010, <http://www.acronym.org.uk/npt/npt2010%20B6%20-%20NWs%20&%20Deterrence.pdf>, DA 7/16/11]

Both deterrence by denial and by threatened punishment may be provided through conventional military means – through rapid deployment of large numbers of forces or other advanced anti-access weaponry that can deny an adversary quick successes**,** for example, or by utilizing means of resistance that force the attacker into a longer and more difficult conflict than envisaged and risk escalation beyond the aggressor’s control. As the US Nuclear Posture Review indicates**,** conventional military capabilities have the potential to exert increasingly effective deterrence effects by denial and by punishment. These include long-range precision strike, pre-emptive targeting of an aggressor’s military facilities with precision-guided munitions, multi-layered defenses, maneuverable forces for rapid or forward deployment, and so on.

## AT- European Aerospace tradeoff

### Alt causalities- European aerospace industry will fail inevitably- integration complexities

Hayes, 2k [Philip Butterworth-Hayes, QUALS, “Efficiency gains pay off in Europe,” Aerospace America, November 2000, <http://www.aiaa.org/aerospace/Article.cfm?issuetocid=28&ArchiveIssueID=7>, DA 7/15/11]//RS

The second reason why Europeans will have a hard time exploiting the weak euro is the expense and sheer complexity of integration. The relatively poor performance of EADS and BAE Systems in the stock markets during the late summer suggest that these integration complexities are proving tough to overcome. While this process will provide savings in the longer term, it will mean upheaval and expense in the short term. For some European companies, economies of scale are not the most important aspect of consolidation.

### Alt causalities- Significant shortfall of engineers will hamper the European aerospace industry’s growth

Milmo, 6/29 [Dan Milmo, Industrial editor, “More school-leavers and graduates must go into manufacturing, says Cable,” June 29, 2011, <http://www.guardian.co.uk/business/2011/jun/29/school-leavers-graduates-lured-away-from-manufacturing-vince-cable>, DA 7/15/11]//RS

Aerospace company Airbus is among the manufacturers warning of a shortfall in engineering talent that is hampering all of Europe. The French, German and Spanish-owned maker of the A380 superjumbo manufactures its wings in Broughton, Wales, in a state-of-the-art facility. However, the company has warned that the UK and western Europe are suffering from a shortage of aerospace engineers. Thierry Baril, head of human resources at Airbus, has warned of a significant shortfall of engineers across the continent. Speaking to the Guardian this month he said that the European aerospace industry needed 12,000 new engineers per year but that educational institutions are producing only 9,000. He said: "In the UK you have exactly the same problem. Many companies are fighting for the same talent."

# Space Leadership Advantage

## 1AC - Space Leadership Advantage

### US Space leadership vulnerable –involvement decreasing and other countries arising

Gregory ‘11

(Bill, formerly a space shuttle pilot and now vice president of engineering company Qwaltec, “U.S. leadership in space is no longer a sure thing,” Houston Chronicle, <http://www.chron.com/disp/story.mpl/editorial/outlook/7654150.html>, 7/14/11, DA: 7/16/11, MadSu)

This generation of Americans has never known a time we did not lead the world in space. But it has not always been this way. President Kennedy's announcement of the Apollo program is famous for its bold call to "take longer strides," but it also included a blunt warning to America that failure was possible because the Soviets were so far ahead. America learned the lessons of that era well. Once we took the lead in space, we never gave it back. But that could be changing — and changing fast. When the shuttle program ends with Atlantis' landing, the United States - for the first time in years - will have no capability to launch astronauts into space. To get our people to and from the orbiting space station, we will have to rely on Russian launches - at more than $60 million a seat. And it's not just a question of the shuttle. Earlier this year, America delayed a critical weather satellite launch until 2016, potentially reducing forecast accuracy by 50 percent and creating the first such coverage gap since the 1960s. While budgets are tight in an era of deadly tsunamis, tornados and extreme weather, the word "myopic" - literally and figuratively - comes to mind. Space exploration has never been easy. But for the last 50 years the United States has refused to accept second place because the stakes have been too high for anything less. Partly this has been a function of our history - the nation of the Wright brothers and the Manhattan Project cannot sit by and leave the next round of great discoveries to others. Partly this has been necessary to preserve our national security - the high ground must always be defended; and space is the new high ground on which battlefield communications, precision targeting and lifesaving missile defense all depend. And partly, it is fiscal common sense. History shows that the country that leads in space is the country that generates economy-changing innovations like computer microchips and satellite communications, as well as lifesaving medical advances like CAT scans and kidney dialysis - more than 1,650 NASA spinoffs since 1976 alone. From satellite forecasting that can increase crop yields by 10 percent to the artificial intelligence that drives some online dating, to the "jaws of life" that save thousands of accident victims each year, virtually every sector of American life has been touched by space-program technologies. Indeed, because of all this follow-on activity, for every $1 spent on the space program, the American economy receives roughly $8 in total benefit, according to noted Stanford professor Scott Hubbard. And all royalties and license payments from NASA patents go directly into the U.S. treasury to pay down our national debt. Despite the national, military and economic benefits of our efforts in space, these programs invariably end up in the crosshairs when budgets get tight - not because of economics but because of politics. In short, because NASA has been responsible and hasn't sprinkled its projects and facilities across a sufficient number of congressional districts, it often pays the political price on the budget guillotine. But our competitors don't sleep in the meantime. China seeks the global prestige and technological edge that comes from space success, and already has dozens of space launches under its belt, including a lunar probe. Next up, it plans to orbit a permanent space station and send Chinese astronauts to the moon. India plans to send astronauts to both the moon and Mars. Brazil, Russia, Japan - even our deadly adversary Iran - are challenging us for the jobs, innovation and military advantages of the high ground of space.

### Space colonization guarantees US leadership-shapes world space policies

Griffin ‘5

(Michael, NASA Space Adminstrator, speech, “Leadership in Space,” <http://www.spaceref.com/news/viewsr.html?pid=18901>, speech made 12/2/05, DA: 7/16/11, MadSu)

As we look forward to the events that will define the 21st Century, as viewed by the historians of yet future centuries, there is no doubt that the expansion of human civilization into space will be among the great achievements of this era. We have the opportunity, and I would say the obligation, to lead this enterprise, to explore worlds beyond our own, and to help shape the destiny of this world for centuries to come. I am convinced that leadership in the world of the 21st Century and beyond will go to the nation that seeks to fulfill the dreams of mankind. We know what motivates those dreams. Exploring new territory when it becomes possible to do so has defined human striving ever since our remote ancestors migrated out of the east African plains. The human imperative to explore new territories, and to exploit the resources of these territories, will surely be satisfied, by others if not by us. What the United States gains from a robust, focused program of human and robotic space exploration is the opportunity to define the course along which this human imperative will carry us. The Vision for Space Exploration affords the United States nothing less than the opportunity to take the lead, not only in this century but in the centuries to follow, in advancing those interests of our nation that are very much in harmony with the interests of people throughout the world. Space will be explored and exploited by humans. The question is: which humans, from where, and what language will they speak? It is my goal that Americans will be always among them. If this is the future we wish to see, we have a lot of work to do to sustain the Vision which takes us there. To me, the choice could not be more compelling. I thank you for your hospitality today, and again extend my hertfelt thanks to all of you for your commitment to regaining the sense of initiative that has driven our past successes.

### Space colonization is key to regain US leadership on Earth as well.

Griffin ‘5

(Michael, NASA Space Adminstrator, speech, “Leadership in Space,” <http://www.spaceref.com/news/viewsr.html?pid=18901>, speech made 12/2/05, DA: 7/16/11, MadSu)

I'm here today to talk about national and world leadership in space - what it means to me, and what I think it takes to achieve and maintain it. I'm certain that most of us here will agree that it is important for the United States to be a leader among the nations of the world, and that such leadership has many dimensions. Economic, cultural, diplomatic, moral and educational leadership are certainly major components of world leadership, and clearly we still live in a time when any wealthy and prominent nation must have the ability to defend itself and its allies. But true leadership also involves defining, and then pursuing, the frontiers that expand mankind's reach. It means occupying the cutting edge of science and technology. It means establishing world technical standards - as we have done in the computing and aviation industries - not through coercion but because we have developed a capability that others wish to use. It also means having the ability and determination to take the lead in building coalitions and partnerships to do those things that fulfill the dreams of mankind. And those dreams have always included the desire to see what lies beyond the known world. To journey beyond the known world today, we must leave Earth entirely. That is the long-held dream that has actively engaged our country and others for nearly 50 years, since our first primitive steps in the exploration of space became possible. And I firmly believe that in the 21st Century world that is taking shape as we speak, a vital part of world leadership will be leadership in the exploration and development of the space frontier. For many years, our country has been rightly recognized as the world leader in the exploration and use of space, and in developing and deploying the technologies that make space leadership possible. Our determination to be first on the Moon and preeminent in other space activities resulted in some of the iconic moments of the 20th Century, and helped to solidify American leadership in the generation after World War II. But, as they say, that was then and this is now. We cannot rest on nor be satisfied with past accomplishments. The true space age, in which humans will explore the worlds beyond our own, is just getting underway. Leadership in establishing a human presence in the Solar System will, in my judgment, be a key factor in defining world leadership back home on Earth for generations to come. Throughout history, the great civilizations have always extended the frontiers of their times. Indeed, this is almost a tautology; we define as "great" only those civilizations which did explore and expand their frontiers, thereby ultimately influencing world culture. And when, inevitably, some societies retreated from the frontiers they had pioneered, their greatness subsided as well. Today, other nations besides our own aspire to leadership on the space frontier. These nations are making progress, and they will undoubtedly utilize their advancements in space to influence world affairs. Their activities will earn them the respect, which is both sincere and automatic, that is accorded to nations and societies engaged in pioneering activities. These things are not in doubt, and so the question before us is this: when other nations reach the Moon, or Mars, or the worlds beyond, will they be standing with the United States, or will we be watching their exploits on television? The President has given us his answer. America will lead. Nearly two years ago, the President said, "We have undertaken space travel because the desire to explore and understand is part of our character. And that quest has brought tangible benefits that improve our lives in countless ways." He also said our Vision for Space exploration is a "journey, not a race." These words are unambiguous. They chart a course for action that is unmistakable. It is imperative that this commitment transcend any given Administration and any given Congress.

### US leadership ensures international security –otherwise there will be prolif, arms races, and resource wars

Sheetz ‘6

(Dr. Mark Sheetz, Faculty Member of the Geneva Centre for Security Policy, GCSP Policy Brief No. 15 *US Hegemony and Globalization,* 2006, DA: 7/16/11, MadSu)

American forces protect Europe and Asia from a potentially destructive cycle of security competition and arms races. Without the stability afforded by American hegemony, Germany and other European states might feel the need to develop their own nuclear deterrents. The same is true for Japan and its Asian neighbors.9 The American military presence in the Middle East serves to ensure the free flow of oil to industrial nations at reasonable prices. This commitment began in the wake of the 1973 oil shock and continued in the wake of the Iranian revolution, after President Carter announced that “an attempt by any outside force to gain control of the Persian Gulf region will be regarded as an assault on the vital interests of the United States of America, and such an assault will be repelled by any means necessary, including military force.”10 The US maintains its commitment to the free flow of oil through its protection of Saudi Arabia. This was the motivation for wars against the Iraqi regime of Saddam Hussein in both 1991 and 2003.11 US hegemony also serves to control the proliferation of nuclear weapons through a combination of military intervention and diplomatic pressure on “rogue” regimes like Libya, Iraq, Iran, and North Korea. America, it seems, is indeed “the indispensable nation,” as Madeleine Albright contended.12 A recent quote by an Egyptian diplomat is telling: “I cannot succeed in pursuing my domestic objectives, economic or political, and I cannot succeed in pursuing my global objectives –- be it on social issues, on arms control issues, on economic issues –- without engaging America.”13 The larger question is whether there is an alternative to American hegemony.14 As far as President Bush is concerned, “the only alternative to American leadership is a dramatically more dangerous and anxious world.

### US heg collapse causes protectionism and political and economic instability –its power is key to globalization

Sheetz ‘6

(Dr. Mark Sheetz, Faculty Member of the Geneva Centre for Security Policy, GCSP Policy Brief No. 15 US Hegemony and Globalization, 2006, DA: 7/16/11, MadSu)

The power and influence of the United States (US) is now the defining feature of world affairs. Indeed, the United States is a hegemonic power insofar as it has been able to impose its set of rules on the international system. The US also provides public goods to the system, such as an international economic, commercial, and financial order and a global political and security order. If globalization amounts to the opening up of national borders to foreign economic, political, and cultural influence, then globalization serves an American vision of world order. What will happen to globalization without the foundation of American hegemonic power? Pressures to reverse political and economic reform may grow, and the forces of protectionism in both its economic and political forms may revive. This paper argues that globalization is the product of a particular set of structural conditions. It is an epiphenomenon of American hegemony, which created and nurtures it. As such, globalization cannot be sustained without US hegemony and will persist only as long as the United States remains the world’s only superpower.

### Protectionism causes World War III – contains every geopolitical impact

Michael J. Panzner, faculty at the New York Institute of Finance, 25-year veteran of the global stock, bond, and currency markets who has worked in New York and London for HSBC, Soros Funds, ABN Amro, Dresdner Bank, and JPMorgan Chase, 2008, Financial Armageddon: Protect Your Future from Economic Collapse, Revised and Updated Edition, p. 136-138

Continuing calls for curbs on the flow of finance and trade will inspire the United States and other nations to spew forth protectionist legislation like the notorious Smoot-Hawley bill. Introduced at the start of the Great Depression, it triggered a series of tit-for-tat economic responses, which many commentators believe helped turn a serious economic downturn into a prolonged and devastating global disaster, But if history is any guide, those lessons will have been long forgotten during the next collapse. Eventually, fed by a mood of desperation and growing public anger, restrictions on trade, finance, investment, and immigration will almost certainly intensify.

Authorities and ordinary citizens will likely scrutinize the cross-border movement of Americans and outsiders alike, and lawmakers may even call for a general crackdown on nonessential travel. Meanwhile, many nations will make transporting or sending funds to other countries exceedingly difficult. As desperate officials try to limit the fallout from decades of ill-conceived, corrupt, and reckless policies, they will introduce controls on foreign exchange, foreign individuals and companies seeking to acquire certain American infrastructure assets, or trying to buy property and other assets on the (heap thanks to a rapidly depreciating dollar, will be stymied by limits on investment by noncitizens. Those efforts will cause spasms to ripple across economies and markets, disrupting global payment, settlement, and clearing mechanisms. All of this will, of course, continue to undermine business confidence and consumer spending.

In a world of lockouts and lockdowns, any link that transmits systemic financial pressures across markets through arbitrage or portfolio-based risk management, or that allows diseases to be easily spread from one country to the next by tourists and wildlife, or that otherwise facilitates unwelcome exchanges of any kind will be viewed with suspicion and dealt with accordingly.

The rise in isolationism and protectionism will bring about ever more heated arguments and dangerous confrontations over shared sources of oil, gas, and other key commodities as well as factors of production that must, out of necessity, be acquired from less-than-friendly nations. Whether involving raw materials used in strategic industries or basic necessities such as food, water, and energy, efforts to secure adequate supplies will take increasing precedence in a world where demand seems constantly out of kilter with supply. Disputes over the misuse, overuse, and pollution of the environment and natural resources will become more commonplace. Around the world, such tensions will give rise to full-scale military encounters, often with minimal provocation.

In some instances, economic conditions will serve as a convenient pretext for conflicts that stem from cultural and religious differences. Alternatively, nations may look to divert attention away from domestic problems by channeling frustration and populist sentiment toward other countries and cultures. Enabled by cheap technology and the waning threat of American retribution, terrorist groups will likely boost the frequency and scale of their horrifying attacks, bringing the threat of random violence to a whole new level.

Turbulent conditions will encourage aggressive saber rattling and interdictions by rogue nations running amok. Age-old clashes will also take on a new, more healed sense of urgency. China will likely assume an increasingly belligerent posture toward Taiwan, while Iran may embark on overt colonization of its neighbors in the Mideast. Israel, for its part, may look to draw a dwindling list of allies from around the world into a growing number of conflicts. Some observers, like John Mearsheimer, a political scientist at the University of Chicago, have even speculated that an "intense confrontation" between the United States and China is "inevitable" at some point.

More than a few disputes will turn out to be almost wholly ideological. Growing cultural and religious differences will be transformed from wars of words to battles soaked in blood. Long-simmering resentments could also degenerate quickly, spurring the basest of human instincts and triggering genocidal acts. Terrorists employing biological or nuclear weapons will vie with conventional forces using jets, cruise missiles, and bunker-busting bombs to cause widespread destruction. Many will interpret stepped-up conflicts between Muslims and Western societies as the beginnings of a new world war.

## Leadership Declining

### US Space Leadership is currently lacking.

Brinton, 09 (Turner, “Obama Urged to Tackle US Space Problems”, “Space News” Staff Writer, February 23rd, 2009, Access Date\_7/13/11).

Some 30 leaders from across the U.S. military, intelligence, civil and commercial space arenas have come together to urge U.S. President Barack Obama to address the systemic problems they say are now plaguing the entire U.S. space enterprise. The nonpartisan, independent Committee for U.S. Space Leadership, composed of current space industry professionals and former top military and civil space officials, has concluded the U.S. space industrial work force problems, looming gaps in important space-based capabilities and widespread program overreach can only be remedied by increased White House involvement. Failure to act, the group said in a memo to the president, could result in further erosion of U.S. leadership in space. The memo, a copy of which was provided to Space News, is being circulated on Capitol Hill and among White House officials.

### Lack of White House support for US Space leadership.

Brinton, 09 (Turner, “Obama Urged to Tackle US Space Problems”, “Space News” Staff Writer, February 23rd, 2009, Access Date\_7/13/11).

Committee member James Armor, a retired Air Force major general, said concerns about the erosion of U.S. space capabilities were raised during meetings of the Space Partnership Council, which he hosted as director of the Pentagon's National Security Space Office. The council includes the heads of NASA, Air Force Space Command and the U.S. National Reconnaissance Office. "They were starting to see the problems across the board, for example, the ability to do the systems engineering in large, complex systems acquisition," Armor said in a Feb. 19 interview. "They were all concerned about it. "[The Committee on U.S. Space Leadership] quickly converged as a group to understand what was lacking was a vision and leadership from a White House level. When there were stovepipe issues from each domain that cut across other domains and agencies, they just weren't getting resolved at the White House level. The Bush administration issued what I thought was a pretty good [National Space Policy] in 2006, but there was no implementing strategy among all the departments and agencies. So a good policy is necessary, but you have to follow through with a decision-making mechanism."

### Slash in NASA’s budget kills US space leadership.

Houston Chronicle, 10 (Walter, “”Taking a bite out of NASA: Slashed budget would decimate agency and leave the US no longer the leader in space, February 6th, 2010, Access Date\_7/13/11).

President Barack Obama's budget proposal may not be a death knell for NASA, but it certainly would accelerate America's downward spiral toward mediocrity in space exploration. Now it's up to NASA's leaders to put the best face possible on this nail that the administration is trying to hammer into their coffin. This proposal is not a “bold new course for human spaceflight,” nor is it a “fundamental reinvigoration of NASA.” It is quite the opposite, and I have no doubt the people at NASA will see it for what it is — a rationalization for pursuing mediocrity. It mandates huge changes and offers little hope for the future. My heart goes out to those who have to defend it. NASA has always been a political football. The agency's lifeblood is federal funding, and it has been losing blood for several decades. The only hope now for a lifesaving transfusion to stop the hemorrhaging is Congress.

### Unclear future for US space exploration and leadership.

Newsleaks, 11 (“End of Space Shuttle End to US Dominance of hegemony in Space”, July 6th, 2011, Access Date\_7/13/11).

The flight into space by NASA’s space shuttle Atlantis this Friday will mark end of the shuttle era, but many believe it may not also mean the end of US hegemony in the space. Although NASA has led numbers of manned flights into space for three decades, no additional such flights are planned for the moment. Top officials at the space agency, however, maintain this isn’t the end of this country’s manned effort in space, rather just the beginning of a new chapter. “I don’t think this means the end of US crewed flights, but we’re in a period of uncertainty and we don’t know for how long,” Valerie Neal, the official in charge of the shuttle area at the National Air and Space Museum in Washington, told Agency. “I think that what’s a little disappointing is that we really don’t have a clear vision of what it is that’s going to come after,” Neal said. “There’s uncertainty in NASA and among the general public.”

### Launching the final space shuttle marks the “end” to US space heg.

The Economic Times, 11 (“End of Space Shuttle, end of US dominance in space?”, July 6th, 2011, Access Date\_7/13/11).

WASHINGTON: The flight into space by NASA's space shuttle Atlantis on this Friday will mark end of the shuttle era, but many believe it may also mean the end of US hegemony in the space. Although NASA has led numbers of manned flights into space for three decades, no additional such flights are planned for the moment. Top officials at the space agency, however, maintain this isn't the end of this country's manned effort in space, rather just the beginning of a new chapter.

### Major lack of support for NASA and space exploration.

Houston Chronicle, 10 (Walter, “”Taking a bite out of NASA: Slashed budget would decimate agency and leave the US no longer the leader in space”, February 6th, 2010, Access Date\_7/13/11).

It is hard to be optimistic. President Obama has apparently decided the United States should not be in the human spaceflight business. He obviously thinks NASA's historic mission is a waste of time and money. Until just two months before his election, he was proposing to use the $18 billion NASA budget as a piggybank to fund his favored education programs. With this budget proposal, he is taking a step in that direction. NASA is not just a place to spend money, or to count jobs. It is the agency that has given us a better understanding of our present and hope for our future; an agency that gives us something to inspire us, especially young people. NASA's Constellation program was not “over budget, behind schedule, and lacking in innovation due to a failure to invest in critical new technologies,” as stated in the White House budget plan. The program's problems were due to perennial budget deficiencies. It would have been sustainable for an annual increase equal to the amount thrown away on the “cash for clunkers” program, or just a fraction of the tens of billions of dollars expended annually on congressional earmarks. It's debatable whether Constellation was the best solution to President George W. Bush's vision of “Moon, Mars and Beyond,” but it was far better than the vacuum in which we now find ourselves, and without a viable alternative in sight.

### US needs to regain Space Leadership after Obama’s budget cuts.

Newsleaks, 11 (“End of Space Shuttle End to US Dominance of hegemony in Space”, July 6th, 2011, Access Date\_7/13/11).

Having invested forty years of time and effort in the exploration and colonization of the moon, the Obama administration suddenly and with no other explanation other than cost, decides to abandon the plan. In addition, there are now other plans in the works to privatize other aspects of the space program. Apparently, the current plans just extend out too far into the future to be of any practical value to either the International Space Station or exploration in general. This is just about what is expected from civilian mindset that ignores the military and strategic value of the moon. The White House needs to back up a bit and take a look at history and the very reason why America was the first to reach the moon, and that was the Cold War. About the time rocketry was reaching the ICBM level, the Soviets launched Sputnik 1, the first orbiting satellite in October of 1957. The so-called "space-age" was born and the United States found itself lagging in the effort. If at first the Soviets' intentions were to upstage the United States on the high-frontier, as the Air Force called it, the communist bloc soon began to explore the military aspects of space, at first in near-Earth orbit.

### Status Quo: Current fear of collapse for US space program.

Longsdon, 11 (John M., “The US space program’s leadership black hole”, Professor at the Space Policy Institute, July 11th, 2011, Access Date\_7/13/11).

In more than 40 years of close observation of the U.S. space program, I don’t think there has ever been more uncertainty and fear of impending program collapse. One result of the current confusion is the too-widespread impression that the final flight of the shuttle means that the U.S. program of human spaceflight has come to an end. This is most certainly not the case. Many American astronauts will be living and working on the International Space Station for the decade to come. And yet equating the end of the shuttle program with the end of human spaceflight is symptomatic of the failure of national leaders to agree on and then communicate a vision of the U.S. future in space.

### US has lost leadership in Space.

Reid, 11 (Bob, “USA No Longer Leader in Space”, Contributer to the San Fransisco Political Buzz, July 8th, 2011, Access Date\_7/14/11).

Today the last space shuttle, Atlantis, lifted off with millions of fans at Kennedy Space Center at Cape Canaveral, Fla.and fans all over the world watching TV. The US of A is no longer a leader in Space may be a bit harsh but for old timers who loved the Space Shuttle; took pride in all of our trips to the Moon and knew that the good old US of A was the best; it was a sad day. We remember NASA because It had the best and the brightest scientists and of course had all the money it needed. The Obama administration has been doing many things I heartedly approve of including restructuring our foreign policy away from the use of American force everywhere in the world to picking our fights. We are getting out of the two wars that have consumed our national treasures; the men and women of our armed forces and billions of tax payer dollars that could have been better spent on our own needs.

### US space leadership slipping now.

Cherry, 11 (Marilyn, “Moon Men: US Space Leadership Slipping”, Staff Writer for The Houston News, May 29th, 2011, Access Date\_7/14/11).

However, they continue, “today America's leadership in space is slipping. NASA's human spaceflight program is in substantial disarray with no clear-cut mission in the offing. We will have no rockets to carry humans to low-Earth orbit and beyond for an indeterminate number of years. “Congress has mandated the development of rocket launchers and spacecraft to explore the near-solar system beyond Earth orbit. But NASA has not yet announced a convincing strategy for their use. After a half-century of remarkable progress, a coherent plan for maintaining America's leadership in space exploration is no longer apparent. “Kennedy launched America on a new ocean. For 50 years we explored the waters to become the leader in space exploration. Today, under the announced objectives, the voyage is over. John F. Kennedy would have been sorely disappointed.”

### US needs to work to regain a stable space regime.

MacDonald, 08 (Bruce W., “China, Space, Weapons, and US Security”, Independent consultant in technology and national security policy management and was the assistant director for national security at the White House Office of Science and Technology Policy as well as senior director for science and technology on the National Security Council staff, September, 2008, Access Date\_7/14/11).

The strategic landscape of this new space era is largely unexplored and poorly understood. Nonetheless, certain objectives are clearly in the interest of the United States. The risks inherent in space conflict, where vital U.S. interests are at stake, suggest that preventing space conflict should be a major U.S. security objective, and that all instru- ments of U.S. power, not just military measures, should be drawn upon to this end. The United States needs to deter others from attack- ing its space capabilities and bolster an international space regime that reinforces deterrence, the absence of conflict in space, and the preser- vation of space as an environment open to all. Such a regime would allow the United States to continue reaping the critical information and service benefits that U.S. military space assets provide. To achieve this, the United States needs vigorous diplomatic initiatives as well as defense programs and strategy.

### US Space dominance unlikely.

MacDonald, 08 (Bruce W., “China, Space, Weapons, and US Security”, Independent consultant in technology and national security policy management and was the assistant director for national security at the White House Office of Science and Technology Policy as well as senior director for science and technology on the National Security Council staff, September, 2008, Access Date\_7/14/11).

Some are attracted to a U.S. posture of dominance in space, and such a vision has superficial appeal. However, this attraction overlooks the serious difficulties that accompany it. Space assets are far more difficult to defend than to attack, and it will be well within China’s ca- pability in the mid term to prevent the United States from attaining a dominant space position. Already China’s economy is growing as fast as that of the United States in absolute terms. One may wish other- wise, but the United States will not be able to maintain its near mono- poly on space power into the future, though perhaps, with smaller margins, it can remain preeminent in space for many years to come.

The United States faces an attractive space future if it does not let the best be the enemy of the good. U.S. space superiority is possible, but space dominance is not likely. Ground-based offensive assets are more survivable, and hence less destabilizing in a crisis, and are also likely to be less expensive and more reliable. Conversely, space-based offensive assets are vulnerable and have significant potential for crisis instability, offering huge incentives for adversaries to strike first. Thus, what the United States chooses to acquire as its offensive capability should first be evaluated against these criteria, as well as those sug- gested on page twenty.

### US losing leadership hurts US and allies security.

Schmitt, 09 (Harrison H., “Geopolitical Context of Lunar Exploration and Settlement”, Former NASA Astronaut and PhD. in Physics, July 30th, 2009, Access Date\_7/14/11).

If we continue to abandon leadership in deep space to other nations or group of nations, particularly a non-democratic regime, the ability for the United States and its allies to protect themselves and liberty for the world will be at great risk and potentially impossible. To others would accrue the benefits — psychological, political, technical, economic and scientific — that the United States harvested as a consequence of Apollo’s success 40 years ago. This lesson has not been lost on our ideological and economic competitors.

### US legacy in space is on the line.

Pappalardo, 10 (Joe, “What happens if NASA’s constellation program dies?”, Senior Editor at Smithsonian's Air & Space magazine, March 9th, 2010, Access Date\_7/14/11).

The legacy of the era could become evident in a decade, when India or China succeeds in returning humanity to the moon. This achievement meant something for national prestige and scientific innovation in the 1960s and it means similar things now. NASA has long been a cradle for innovation as well as innovators. Without the appeal of a human flight program, will fewer aspiring scientists and engineers be lured into the agency and towards military and private space? Will the research end of NASA suffer from this lack of inspirational purpose? What are the geopolitical ramifications, if any, of this waning of American power?

### Concern about America’s competitiveness in space.

Bacchus, 11 (James, “American competitiveness needs space program”, a former Member of Congress, from Florida’s 15th Congressional District, which includes the Kennedy Space Center. He was one of the principal Congressional sponsors of the International Space Station. He chairs the global practice of the Greenberg Traurig law firm, March 16th, 2011, Access Date\_7/15/11).

At a time of growing concern about American competitiveness, does it make sense to throw away the critical mass and the critical skills of thousands of space workers whose labors have secured and sustained America’s comparative advantage in what will surely be one of the key global industries of the coming century?

### US must currently work to regain disposition in the global community.

Newton, 11 (Elizabeth K., “United States space policy and international partnership”, Professor of Physics – University of Alabama, Former Administrator for NASA, February, 2011, Access Date\_7/15/11).

Before delving into details, it is worth noting that US space policy is most accurately viewed as an aggregate of White House issuances and legislative policy making codified in law, as well as of executive branch agencies’ translation of these broad or narrow directions into programs, operating budgets, and processes. Indeed, agencies’ deeds are more telling than any White House-level rhetoric about intent. For this reason, it may be that currently we can only judge the potential for the policy to deliver results, allowing sufficient time to see whether policy’s implementation succeeds or fails. Evaluating whether or not the USA’s overall strategic position is improved – that is, whether its ability to influence positively the conditions of its existence and play the role it chooses is enhanced – can be distilled down to questions about security, political economy, and influence. These three dimensions are coupled, of course, but they can provide a way of disaggregating space policy for closer inspection.

### Future US Leadership at risk.

Newton, 11 (Elizabeth K., “United States space policy and international partnership”, Professor of Physics – University of Alabama, Former Administrator for NASA, February, 2011, Access Date\_7/15/11).

The USA is a majority funder for many space programs and is a technology leader, two features which have provided sufficient motivation for partners to accept US leadership, even when unfortunately high-handed. It is a stunning failure of political will to lack a successor system to the retiring Space Shuttle, and so the US cedes leadership in human spaceflight with its inability to access the ISS independently, for itself or for its partners, until a new commercial capability has been demonstrated. The USA further relinquishes leadership when abandoning years of work on strategic planning and guidance, the evaluation of alternatives, and orchestration of diverse but important contributions that were manifested in the Global Exploration Strategy. Sudden redirections without consultation are not hallmarks of leadership and will no doubt motivate partners to do more unilateral planning and execution, at least for a while. Finally, leadership in the future is at risk: how can the USA hope to influence outcomes and protect interests – strategic, commercial, and cultural – on the Moon if it is not present?

### No recent actions prove the US cares about the space program.

Dinerman, 10 (Taylor, “National Space Policy: From Strength to Weakness, Part 2”, Taylor Dinerman is a well-known and respected space writer regarding military and civilian space, July 29th, 2010, Access Date\_7/15/11).

The space policy claims that the administration is committed to American space leadership, yet by its actions so far, it has undermined that leadership and put this county on a path to becoming a second rate space power. Previous administrations have got to share some of the blame for this, particularly in the Nixon-Ford-Carter era when the Saturn V Moon rocket program was cancelled and the Shuttle was starved of development funding. For the most part, the best that can be said of this new policy is that it could have been worse.

### US budget cuts for space- international controversy.

Dinerman, 10 (Taylor, “National Space Policy: From Strength to Weakness, Part 2”, Taylor Dinerman is a well-known and respected space writer regarding military and civilian space, July 29th, 2010, Access Date\_7/15/11).

There is also the strong possibility that relatively uncontroversial international space science programs will see their budgets cut by the next congress. Constellation was an essential part of the delicate political balance that NASA had achieved. The attempt to destroy it, whether it succeeds or not, has endangered all of NASA's programs. Anything with the label "international" will now be a ripe target for budget cutters, after all foreign space scientists do not vote in US elections.

### Presidents budget cut crushed US space leadership.

Bishop, 10 (Rob, “Space cuts short-sighted”, Rob Bishop is Utah's representative from the 1st District, February 25th, 2010, Access Date\_7/15/11).

The Obama budget would cancel the Constellation program, cancel the Ares I rocket for manned space travel, cancel the Ares V rocket for cargo and cancel the Orion manned space capsule. The only apparent replacement for all of this is some nebulous funding for grants to commercialize our space exploration with no tested or proven alternative. It would be one thing if gutting the space program was an attempt to save money. But it isn't. In fact, the Obama plan does not eliminate wasteful spending. It actually adds an additional $1.5 billion to the NASA budget, but spends it in the wrong places. The president's proposals for NASA will, however, destroy U.S. leadership in space exploration. Russia and China will control space. Instead of sending 40 or so American astronauts to space each year, we will end up sending four or five. And they will essentially be trying to hitch a ride on a Russian or Chinese rocket.

### NASA has no choice but to lose leadership after budget cuts.

Aderholt, 11 (Robert, “The President’s Space Policy Will Compromise American Jobs and American World Leadership”, Representative from Alabama, June 29th, 2011, Access Date\_7/15/11).

However, the President now wants to severely downgrade the one task which makes NASA unique — human exploratory space flight. On February 1, 2010, the Administration announced a budget which proposes to eliminate the NASA Constellation program. Since that time, NASA has canceled the awarding of contracts or put on hold parts of numerous contracts which were a part of the regular fiscal year 2010 work for the Constellation program, despite the fact that Congress must first approve its termination before it becomes final policy. President Obama and NASA are putting American jobs in jeopardy because of a drastic proposal that isn’t even actual law. This plan put forth by the President is simply that – a plan, and NASA should not be assuming that this plan will be approved by Congress

### Loss of US space leadership- domestic and economic consequences.

Aderholt, 11 (Robert, “The President’s Space Policy Will Compromise American Jobs and American World Leadership”, Representative from Alabama, June 29th, 2011, Access Date\_7/15/11).

Since February, I have fought the President’s proposal to cancel Constellation because it will forfeit America’s leadership in space and it will cut thousands of jobs in Alabama and the entire nation. During the last month, contractors, under intense pressure from NASA regarding contract termination liability, have already begun laying off workers and canceling subcontracts, despite the fact that Congress has not approved the President’s proposal. That’s why I have introduced the “Protecting Human Space Flight Act of 2010” this week. This bill directs NASA to use FY2010 appropriated funds for what it was intended to do – work on the Constellation program, not a termination liability account. President Obama has been saying for years that the goal of his Administration is to save or create American jobs. With the President’s new proposal for NASA, he is doing just the opposite.

### Lack of US leadership now-space dominance being taken over by other countries.

Kislyakov, 11 (Andrei, “China gaining ground in space”, a political commentator for the RIA Novosti news agency, May 22nd, 2011, Access Date-7/15/11).

Another project of this kind is the U.S.-Russian International Space Station program. Despite NASA's public statements, the United States sees the use of Russian spaceships as a forced measure. In addition, NASA has failed to clearly formulate its vision of the ISS future once the Space Shuttle Program is over. Cooperation between Russia and Europe in space is less dramatic and has not resulted in any impressive joint programs. The declared Roscosmos - ESA program of developing a new space shuttle system has not seen any practical steps yet. Moreover, Europeans consider any dependence on "the Russians" in organizing manned flights would be unacceptable. However, in terms of finance and technology, space exploration programs are hard to implement without the involvement of other countries. As Andrei Ionin, a corresponding member of the Tsiolkovsky Russian Academy of Cosmonautics, puts it: "Today we must think about who our key partners in space exploration are. This may be the right moment to start looking eastward, rather than westward. Centers of economic, technological and political power have been shifting to the Asia-Pacific region, where China, Japan and South Korea are experiencing dynamic development." Once the Asia-Pacific Space Cooperation Organization has advanced to the practical stage, there will be another reason for "looking eastward."

### Symbolic end for US leadership in space.

Spudis, 11 (Paul, “NASA’s mission to Nowhere”, Paul D. Spudis is a planetary scientist, principal investigator of the Mini-SAR imaging radar on the Chandrayaan-1 mission and author of “The Once and Future Moon”, February 11th, 2011, Access Date\_7/15/11).

For 50 years, America has maintained this ability through an infrastructure of cutting-edge industrial hardware, specialized facilities and a skilled work force. By adopting the new program, we will lose - probably irretrievably - this space-faring infrastructure and, most certainly, our highly trained, motivated and experienced work force. It will be prohibitively expensive and difficult to restart our manned program after five to 10 years of agency navel-gazing, effectively signaling the end of America’s manned space program and our leadership in space.

### America’s space leadership on the decline.

Armtrong, Lovell, and Cernan, 11 (“Obama grounding JFK's space legacy?”, NASA Astronauts;

commanded moon missions, May 24th, 2011, Access Date\_7/16/11).

The response to Kennedy's bold challenge a half-century ago has led to America's unchallenged leadership in space. We take enormous pride in all that has been accomplished in the past 50 years. And we have the people, the skills and the wherewithal to continue to excel and reach challenging goals in space exploration. But today, America's leadership in space is slipping. NASA's human spaceflight program is in substantial disarray with no clear-cut mission in the offing. We will have no rockets to carry humans to low-Earth orbit and beyond for an indeterminate number of years. Congress has mandated the development of rocket launchers and spacecraft to explore the near-solar system beyond Earth orbit. But NASA has not yet announced a convincing strategy for their use. After a half-century of remarkable progress, a coherent plan for maintaining America's leadership in space exploration is no longer apparent.

### Lack of confidence towards the future of US space dominance. Crisostorno, 10 (Christian, “NASA's Constellation Program Planning To Take Initiative For Moon Colonization”, Researcher for Open Talk Magazine, November 12th, 2010, Access Date\_7/16/11).

It is a massively ambitious project that would have to be well funded to succeed. Unfortunately in February 1, 2010, United States President Barack Obama called for a cancellation of the program; as seen in its exclusion from the 2011 United States federal budget. We are now just left to wonder if the program could ever carry out its vital mission to propel the United States back again as the leader in human space flight.

### US falling behind in global space race.

Zey, 10 (Michael, “As US Abandons Manned Flight, China, Russia, Europe Train For Space Colonization with Mars500”, renowned and thought-provoking keynote speaker on a variety of social, economic, technological, and political trends For over two decades he has keynoted various conferences, professional meetings, and trade shows for organizations such as AT&T, United Technologies, United Airlines, Dow Jones, and the World Future Society, June 7th, 2010, Access Date\_7/16/11).

Clearly the US is falling behind in the global space race. Recently the Obama administration decided to direct NASA's funding away from manned space flight to the Moon and beyond. The US is even ending its shuttle program this year. Although the President did give lip service to the goal of colonizing Mars in the mid-2030s, many critics, including Mars Society president Robert Zubrin, were unmoved by this weak and ambiguous commitment to space exploration. "It basically means that they don't have to start working on it while they're in office," Zubrin said.

### International competitors invading on US space dominance.

Hoffman, 11 (Michael, “Boeing Chief: U.S. Should Lead in Space Tech”, Defense News, April 8th, 2011, Access Date\_7/16/11).

A year after China demonstrated its ability to attack satellites by striking one of its own weather satellites with a ballistic missile, Albaugh said, it's also important to develop methods to protect U.S. space assets. Air Force Space Command officials have said increasing the Department of Defense's ability to monitor space assets and potential attacks tops their priority list. Boeing was contracted to help develop the Air Force's Space Based Space Surveillance system back in 2004. "We can clearly see our international competitors fast approaching in the rear view mirror," he said. "This is not the time to take a backseat. If we do, the consequences will be non-recoverable and future generations will judge us harshly."

### China poses a threat to US space leadership

Garibaldi, 06 (Gabriele, “The Chinese Threat to American Leadership in Space”, Association for Asian Research, December 5th, 2006, Access Date\_7/16/11).

Walker's conclusion is that the Chinese space program has yet to be taken seriously by American politicians. Nevertheless, it represents a serious challenge to the US leadership in Space. The US must answer such a challenge by developing new technologies (for instance, the nuclear plasma propulsion system) in order to reach the Moon and Mars faster than currently possible, and to travel more frequently and thriftily into Earth's low orbit.

### China’s control over space-significantly greater than US dominance. Garibaldi, 06 (Gabriele, “The Chinese Threat to American Leadership in Space”, Association for Asian Research, December 5th, 2006, Access Date\_7/16/11).

As the situation currently stands, it is clear that the expression “to assure our continued access to space and deny the space to others if necessary” - recurrent, with little variations, in the US military plans - is specifically directed towards China. The Pentagon believes that China has the same intention towards the ousting the United States from Space, and considers its polemic declarations about the “rumoured” US plans of space weaponization - expressed in front of the UN Committee on the Peaceful Uses of Outer Space - as the weapon to diplomatically damage and slow down the action of the USA, while actively working in secret towards the same objective. According to Larry Wortzel, director of the Asian Studies Center at the Heritage Foundation, the introduction by the Chinese of a draft treaty devised to act against the US's intent to develop space weapons is misleading (“…because they’re developing their own space-based weapons...”), having no other purpose than to diplomatically damage the USA and thus delay their Theater Missile Defense plan, while China continues with its own plans. According to Richard Fisher of The Jamestown Foundation, the People's Liberation Army is aware that the “control of space” concept - as theorized by the US military - is an objective that China must achieve: “China needs to be able to deny to the United States access and use of space, as they themselves exploit space to support their own forces”.

## Now Key

### Now key – China is actively pursuing space and will take over US space leadership

Vause 07 [John - CNN correspondent, 11/26/2007, “China's ambitious plans in space”, http://articles.cnn.com/2007-11-26/tech/china.space.race\_1\_chang-e-helium-3-lunar-orbiter/2?\_s=PM:TECH]

When China's lunar orbiter blasted off last month, there was not a cheer or smile or a "whoo-haaa" to be had in mission control. Perhaps because for the government scientists, it was just another small step in an ambitious space program which could ultimately see a Chinese space station orbiting the Earth, a Chinese moon colony and a joint China-Russia explorer on Mars. If all goes well, and so far it has, the Chang'e 1 will spend the next year orbiting the moon, mapping the surface and looking for resources. Next, the Chinese hope to send an unmanned rover to the moon by 2012, with a robotic mission to bring back samples by 2017. Officials have recently backpedaled from goals of putting a taikonaut (the Chinese version of an astronaut or cosmonaut) on the moon by 2020, but analysts believe that is still a pressing ambition. "If China can go to the moon, eventually with a manned program, it will represent the ultimate achievement for China in making itself essentially the second most important space power, accomplishing what even the Soviets had not," says Dean Cheng, a China military analyst for CNA, a private research corporation. Watch China's lunar rocket blast off According to Cheng, the Chinese are now embarking on a systematic space program the world has not seen since the 1960's and for the first time since the collapse of the Soviet Union, the United States is facing real competition. That may explain why the head of NASA, Michael Griffin, recently warned that "China will be back on the moon before we are . . . I think when that happens Americans will not like it." China's space milestones But there could be a lot more at stake than just lunar boasting rights. It's unlikely the Chinese will land at Tranquility Base and pull down the Stars and Stripes. But the goal could be mining resources. One powerful, potential fuel source is helium-3. Helium-3 originated from the sun and was deposited in the moon's soil by the solar wind. It is estimated there are up to two million tons on the moon, and virtually none on Earth. "If we can ever get helium-3 and helium-3 to fuse together it is what we call nuclear power without nuclear waste -- there is no radioactivity associated with that reactor," says Professor Gerald Kulcinski, an expert in helium from the University of Wisconsin. The key though, says Kulcinski, will be developing a fusion reactor, which he says could be done within 15 to 20 years, in tandem with a program to establish a permanent human presence on the moon. Just four tons of helium-3 would be enough to supply all the power needs for the United States for a year, two shuttle payloads according to Kulcinski. Analysts believe the lure of such potent resources is one of the reasons behind China's exploration of space. State media reported last month details of a new rocket with enough thrust to put a space station into orbit. When it's developed, the Long March 5 will have almost three times the power of existing rockets. China has long wanted to be part of the international space station, but has always been denied, partly it's believed because of U.S. concerns. But that may not be a problem for the Chinese if they can send their own space station into orbit, reportedly by 2020. But again the Chinese are sending mixed messages, saying no firm date has been decided. More immediately, there are plans a for televised space walk by three taikonauts next year, according to the Shanghai Daily. At a recent news conference Pei Zhaoyu from China's space administration repeated at least three times that "China has always adhered to the principle of peaceful use of outer space." But he made no mention of China's satellite killer missile which was tested earlier this year, destroying an aging Chinese weather satellite in low Earth orbit. That and the fact that China's space administration is controlled by the military has many in Washington worried about where the Chinese are heading. Technologically, the Chinese are still behind the United States, but analysts warn that might not be the case for much longer. "The Chinese have the advantage of a centralized decision-making authority where they can say we will do that and we will apply those funds," says Cheng, while pointing out that NASA is at the mercy of Congress, politics and a new president in 2009 who may have new goals and ambitions. China has always insisted that it's not in a space race with any country, especially the United States -- but it is on a slow, relentless march to the moon, and beyond.

### US needs to get involved in space now to maintain or gain leadership.

Longsdon, 11 (John M., “The US space program’s leadership black hole”, Professor at the Space Policy Institute, July 11th, 2011, Access Date\_7/13/11).

Here is where effective leadership is so badly needed, and it can only come from the White House. Barack Obama in public statements has offered his personal support of NASA; as the shuttle lifted off last Friday, he said, “Today’s launch may mark the final flight of the space shuttle, but it propels us into the next era of our never-ending adventure to push the very frontiers of exploration and discovery in space.“ The president and his senior staff need to back up these words with intense engagement with Congress to reduce the differences between the president’s vision for space and congressional preferences, so that the level of uncertainty can be significantly reduced. Without strong White House support, NASA leaders by themselves cannot achieve that goal. With it, there can be grounds for agreement on a sustainable path forward. Given everything else on the president’s plate and the many other issues dividing the two ends of Pennsylvania Avenue, suggesting more active high-level White House involvement in space issues may not be very realistic. But it seems the only way out of a deplorable situation. It does no honor to the achievements of the space shuttle program to have its end come with no clear sense of what will follow.

### Crucial for America to reinvigorate space exploration.

Bacchus, 11 (James, “American competitiveness needs space program”, a former Member of Congress, from Florida’s 15th Congressional District, which includes the Kennedy Space Center. He was one of the principal Congressional sponsors of the International Space Station. He chairs the global practice of the Greenberg Traurig law firm, March 16th, 2011, Access Date\_7/15/11).

That’s not how I saw it years ago when I was vice president of the space club at South Seminole Junior High School in Central Florida, and we were reaching for the moon. That’s not how anyone who has ever worked for America’s space program, or in any way been a part of that program, sees it. As we see it, the space shuttle Discovery was rightly named. If America stands for anything, it stands for discovery. Our historic task as Americans is to discover more. It is to use our freedom to extend as far as we can the ultimate reach of human experience, knowledge, and understanding. To fulfill this task, we must reach for the stars.

### American needs to act now to regain any space dominance.

Tyoson, 10 (Peter, “Buzz Aldrin’s Timetable for Colonizing Mars”, PBS Inside Nova, September 21st, 2010, Access Date\_7/16/11).

America should act now, Aldrin says. With the Apollo program 40 years ago, the U.S. gained a dominant position in space exploration. But other countries, including the foursome loosely known as BRIC — Brazil, Russia, India, and China — have their eyes on space. (“You might call them the wannabes of space leadership,” Aldrin told me.) Russia, for one, plans to send a soil-sampling mission to Phobos, one of the martian moons, in 2011. Aboard will be a Chinese satellite to orbit the Red Planet.

### Acting now is key to the US taking steps towards the moon. Crisostorno, 10 (Christian, “NASA's Constellation Program Planning To Take Initiative For Moon Colonization”, Researcher for Open Talk Magazine, November 12th, 2010, Access Date\_7/16/11).

“That's one small step for man, one giant leap for mankind”. This was former Apollo crew member Neil Armstrong’s most famous line as he went down the Eagle lunar module. Since the end of the Apollo program in 1975, man has never attempted to go beyond low-Earth orbit. The quest to go to other celestial bodies in the Solar System literally came to a standstill. That is, until NASA has returned with yet another ambitious mission to send the space program once again back on track. Their latest space program plans to fulfill this mission, and its success would determine the next step towards conquering the moon, and beyond.

### US space program at a crucial transition period-changes need to be made.

Hoffman, 11 (Michael, “Boeing Chief: U.S. Should Lead in Space Tech”, Defense News, April 8th, 2011, Access Date\_7/16/11).

While Congress debates how it will fill the gap after the shuttle is retired and a new NASA launch technology is made operational, and military leaders scramble to develop new measures to protect U.S. satellites, Albaugh said, the next decade for the U.S. space program will be its "most crucial" since the 1950s. To keep the U.S. space program ahead of international competitors like China, Albaugh said, advancing space propulsion technologies by cutting its astronomical costs and increasing its efficiency will be critical.

## Leadership Solves – Tech Innovation

### The US space leadership is key to jumpstarting space missions, success of the private sector, and technological infrastructure

Coledan 04 [Stefano Coledan – aerospace consultant at Radiotelevisione Italiana “Mining The Moon”, 12-7-04, http://www.popularmechanics.com/science/space/moon-mars/1283056, Popular Mechanics]

That vision seemed impossibly distant during the decades in which manned space exploration languished. Yes, Americans and others made repeated trips into Earth orbit, but humanity seemed content to send only robots into the vastness beyond. That changed on Jan. 14, 2004, when President George W. Bush challenged NASA to "explore space and extend a human presence across our solar system." It was an electrifying call to action for those of us who share the vision of Americans leading humankind into deep space, continuing the ultimate migration that began 42 years ago when President John F. Kennedy first challenged NASA to land on the moon. We can do so again. If Bush's initiative is sustained by Congress and future presidents, American leadership can take us back to the moon, then to Mars and, ultimately, beyond. Although the president's announcement did not mention it explicitly, his message implied an important role for the private sector in leading human expansion into deep space. In the past, this type of public-private cooperation produced enormous dividends. Recognizing the distinctly American entrepreneurial spirit that drives pioneers, the President's Commission on Implementation of U.S. Space Exploration Policy subsequently recommended that NASA encourage private space-related initiatives. I believe in going a step further. I believe that if government efforts lag, private enterprise should take the lead in settling space. We need look only to our past to see how well this could work. In 1862, the federal government supported the building of the transcontinental railroad with land grants. By the end of the 19th century, the private sector came to dominate the infrastructure, introducing improvements in rail transport that laid the foundation for industrial development in the 20th century. In a similar fashion, a cooperative effort in learning how to mine the moon for helium-3 will create the technological infrastructure for our inevitable journeys to Mars and beyond.

### US Space exploration creates national hope and future innovation.

Bell, 11 (Larry, “Does the United States Still Care About Space Leadership?”, Columnist for Forbes”, July 12th, 2011, Access Date\_7/13/11).

Yes, space exploration programs produce technological innovations, but even more, don’t they produce inspiration for our children, grandchildren and other generations who follow to realize that the sky is literally no limit to what can be achieved with ambitious goals, solid educational foundations and disciplined commitment? They will be the ones that advance future innovation and progress in all fields. Contributions to encourage vision, leadership and competence are vital products that will drive our nation’s future – and theirs as well.

### Unlimited rewards result from US space exploration and leadership.

Bell, 11 (Larry, “Does the United States Still Care About Space Leadership?”, Columnist for Forbes”, July 12th, 2011, Access Date\_7/13/11).

It’s difficult to ignore the symbolic and real benefits of international cooperation and national prestige gained through space exploration developments. But I submit that there is something else that our programs represent of equal or even greater value. Namely, it is less important how the rest of the world views us; instead it’s about how we see ourselves: as a culture willing to take risks in quests for uncertain, yet potentially unlimited rewards; as a nation that recognizes that to not do something presents one of the greatest risks of all; because that’s the sort of people we are.

### US space innovation key to US innovation and world image.

Mason & Dixon Polling and Research, 11 (“Sachs/Mason-Dixon Poll Finds Strong Support for America’s Continued Role as Global Space Leader”, July 7th, 2011, Access Date\_7/14/11).

In a dramatic new Sachs/Mason-Dixon poll, an overwhelming majority of Americans say they don’t want America’s manned space program to end and they believe the United States should continue to be a global leader in space. The results of the poll follow the recent return of the Space Shuttle Endeavour – the penultimate NASA Space shuttle mission. “Human space flight symbolizes American ingenuity, innovation and imagination and any effort to ensure our nation remains at the forefront of manned space flight is strongly supported by the American people,” said Ron Sachs, President of Ron Sachs Communications. “The American people are emotional about maintaining our nation’s leadership in this important scientific endeavor.”

### US must stay active in space to maintain leadership and gain new tech opportunities.

Schmitt, 09 (Harrison H., “Geopolitical Context of Lunar Exploration and Settlement”, Former NASA Astronaut and PhD. in Physics, July 30th, 2009, Access Date\_7/14/11).

The competitive international venue remains at the Moon. Returning there now meets the requirements for a U.S. space policy that maintains deep space leadership, as well as providing major new scientific returns and opportunities. Without a lunar focus, the nation’s human space activity will consist of PowerPoint presentations about what might be done and not about what will be done. Properly conceived and implemented, however, returning to the Moon prepares the way for a new generation to go to Mars.

## Leadership Solves – Cooperation

### US leadership promotes international cooperation.

Friedman, 11(Lou, “American Leadership”, Executive Director and Co-founder of “The Planetary Society” and holds a PhD. in Aeronautics and Astronautics from M.I.T., February 14th, 2011, Access Date\_7/13/11).

“American Leadership” is a phrase we hear bandied about a lot in political circles in the United States, as well as in many space policy discussions. It has many different meanings, most derived from cultural or political biases, some of them contradictory. The term sometimes arouses antipathy from non-Americans and from advocates of international cooperation. They may find it synonymous with American hubris or hegemony. It is true that American leadership can be used as a nationalistic call to advance American interests at the expense of non-American interests. But more often it may be used as an international call for promoting mutual interests and cooperation. That is certainly true in space, as demonstrated by the International Space Station, Cassini-Huygens, the James Webb Space Telescope, the Europa Jupiter System Mission, Mars 2016/2018 and Earth observing satellites.

### US Space Leadership is key to relations and perception in global society.

Stone, 11(Christopher, “American Leadership in Space: leadership through capability”, Space policy analyst and strategist from Washing D.C., March 14th, 2011, Access Date\_7/13/11).

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 using 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.

### Space leadership benefits US in the international community.

Stone, 11(Christopher, “American Leadership in Space: leadership through capability”, Space policy analyst and strategist from Washing D.C., March 14th, 2011, Access Date\_7/13/11).

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.

### US space leadership essential.

Kohut, 11 (Andrew, “Majority sees US Leadership is Space essential”, President of the Pew Research Center, July 5th, 2011, Access Date\_7/13/11).

On the eve of the final mission of the U.S. space shuttle program, most Americans say the United States must be at the forefront of future space exploration. Fifty years after the first American manned space flight, nearly six- in-ten (58%) say it is essential that the United States continue to be a world leader in space exploration; about four-in-ten say this is not essential (38%). Looking back on the shuttle program, a majority (55%) say it has been a good investment for the country. However, this is lower than it was in the 1980s; throughout the early years of the shuttle program, six-in-ten or more said the program was a good investment. Majorities in nearly all demographic groups say it is essential that the U.S. continue to be at the vanguard of space exploration. And partisan groups largely agree that American leadership is vital, although this view is more prevalent among Republicans. Two-thirds of Republicans (67%) say the nation must continue to play an international leadership role in space exploration; smaller majorities of Democrats (54%) and independents (57%) say this.

### US space leadership good for America’s image. (General Stats)

Kohut, 11 (Andrew, “Majority sees US Leadership is Space essential”, President of the Pew Research Center, July 5th, 2011, Access Date\_7/13/11).

Large majorities say that the space program has helped encourage interest in science, led to scientific advances and contributed to feelings of patriotism. But no more than about four-in-ten say that the program has contributed “a lot” in any of these areas. Overall, 39% say it has contributed a lot to encouraging interest in science, 35% say it has contributed some while 22% think it has contributed not much or nothing. Nearly as many (38%) say the space program has contributed a lot to scientific advances that all Americans can use, while 34% think it has done a lot for feelings or pride and patriotism.

### US Space Leadership key to moral and global perception.

Stevens, 07 (Robert, “The Next 50 years of US Space Leadership”, Chairman, President & Chief Executive Officer, Lockhead Martin Corporation, April 10th, 2011, Access Date\_7/14/11).

Let me be clear: I’m not advocating reckless endeavors, foolish pursuits, or the abandonment of good process and sound practice. The effective management of modern space programs requires great care. But all tests that don’t confirm the hypothesis are not necessarily failures. Some results that were not in keeping with expectations have proven extremely valuable and worthy of our effort. And, most importantly, setbacks are not the product of poor character or lack of integrity by those involved in the process. To characterize it as such would be a huge disservice to so many who work with complete dedication each day. Think back to 1958, when President Eisenhower approved a top secret program to surveil the Soviet Union from space. Lockheed partnered with the government to create the CORONA satellite system. It took thirteen tries before the CORONA team successfully recovered the film capsule from space. Put another way, CORONA failed 12 times. But we didn’t give up. Our customer didn’t lose faith. Congress provided the money. And that perseverance paid off many times over – as America peered over the Iron Curtain ... verified what we did not trust ... and strengthened our security. I wonder if CORONA would have made it in today’s environment. I have my doubts. Let’s do our best to realistically describe risks and maintain support for complex programs so we don’t abandon capabilities before they can achieve their potential. At the end of the day, this discussion is not about NASA ... it’s not about the U.S. military ... it’s not about any single company or segment of the private sector. It’s about America – who we are as a people, and what we aspire to be as a nation. We can’t go back to the no-holds barred approach of the ‘50s and ‘60s, but we should not wait for the crisis of a modern day Sputnik to unite us and galvanize action. We, here, are the ones who can most make this happen… and our countdown has already begun.

### US involvement in space increases US diplomacy.

MacDonald, 08 (Bruce W., “China, Space, Weapons, and US Security”, Independent consultant in technology and national security policy management and was the assistant director for national security at the White House Office of Science and Technology Policy as well as senior director for science and technology on the National Security Council staff, September, 2008, Access Date\_7/14/11).

Some advocate primarily an arms control approach to the counter- space challenge. The growing multilateral nature of the problems that the United States and others face in space strongly suggests that dip- lomatic approaches have an important role to play in constructing a space regime that best meets U.S. security needs, perhaps including specific arms control agreements. Unfortunately, China’s ASAT test, its ongoing programs, the United States’ growing military dependence upon space, and the general advance of technology available to many countries indicate that reliance purely on negotiated agreements and defensive measures to protect U.S. space assets would involve a high degree of security risk. With its ASAT test and its arms control pro- posal, China appears to have shown that its interest in banning space weapons applies chiefly to space-based, not ground-based, weapons. The latter would be harder to verify in any event.

### US Space involvement aids US diplomacy.

MacDonald, 08 (Bruce W., “China, Space, Weapons, and US Security”, Independent consultant in technology and national security policy management and was the assistant director for national security at the White House Office of Science and Technology Policy as well as senior director for science and technology on the National Security Council staff, September, 2008, Access Date\_7/14/11).

Diplomacy has an important role to play in U.S. space security inter- ests, and it is unfortunate that in recent years the United States has not made more use of it. Three broad approaches exist: dialogue, voluntary cooperation regimes, and formal agreements. Dialogue on space wea- pons has been minimal, though there has been more in non-weapons areas, such as debris. The administration has strongly resisted formal agreements that legally obligate signatories to comply. The only new restrictions it has supported are voluntary, e.g., debris limitations and best practices on safe space operations. Vigorous U.S. opposition has prevented UN negotiations on a treaty to prevent an arms race in outer space (PAROS), though the UN Conference on Disarmament (UNCD) is not an ideal forum for such early discussions because of its unwieldy size.

### Expanding US space efforts key to diplomacy.

Hawkins, 11 (William R., “Forfeiting US Leadership in Space”, consultant specializing in international economic and national security issues. He is a former economics professor and Republican Congressional staff member, March 7th, 2011, Access Date\_7/14/11).

The National Aeronautics and Space Administration (NASA) has put out its 2011 Strategic Plan. Its first goal is to "extend and sustain human activities across the solar system." As the lead civilization of the current era, it is America's duty to advance human achievement. Yet, there is very little in the NASA plan or budget to fulfill this noble goal. The NASA plan relies first and foremost on "expanding efforts to utilize the ISS as a National Laboratory for scientific, technological, diplomatic, and educational purposes and for supporting future objectives in human space exploration." But without the shuttle or a replacement space vehicle, the U.S. will be dependent on the Russians for access to the ISS.

### Abandoning US Leadership in Space hurts US global credibility.

Schmitt, 09 (Harrison H., “Geopolitical Context of Lunar Exploration and Settlement”, Former NASA Astronaut and PhD. in Physics, July 30th, 2009, Access Date\_7/14/11).

In spite of the difficulties that have faced Constellation, history tells us that an aggressive program to return Americans to deep space, initially the Moon and then on to Mars, must form an essential component of national policy. The current course of United States in space appears to be to have no national capability to launch its astronauts, at all. Americans would find it unacceptable, as well as devastating to human liberty, if we abandon leadership in deep space to the Chinese, Europe, or any other nation or group of nations. Potentially equally devastating would be loss of access to the energy resources of the Moon as fossil fuels diminish on Earth. In the harsh light of history, it is frightening to contemplate the long-term, totally adverse consequences to the standing of the United States in modern civilization of a decision to abandon deep space. Space does not represent just another large-scale science arena that can be abandoned limited only to the science leadership consequences the United States has suffered in recent decades.

## **Leadership Solves – Hege**

### **US space dominance key to hard and soft power.**

Dinerman, 10 (Taylor, “National Space Policy: From Strength to Weakness, Part 2”, Taylor Dinerman is a well-known and respected space writer regarding military and civilian space, July 29th, 2010, Access Date\_7/15/11).

For decades, America's space programs have been used to project power of both the hard and soft varieties. Allies have long benefited from indirect, and, in rare cases from direct access to the Defense Department's various space systems. Throughout the world, every minute of every day, people use the Global Positioning System (GPS) signals, most of the time without even realizing that they come from a set of US military satellites. In the civilian realm the International Space Station which is now almost complete has been largely built and paid for by US taxpayers.

### Rebuilding American’s space leadership-essential for security and global perception.

Dinerman, 10 (Taylor, “National Space Policy: From Strength to Weakness, Part 2”, Taylor Dinerman is a well-known and respected space writer regarding military and civilian space, July 29th, 2010, Access Date\_7/15/11).

The Bush National Space Policy document of August 2006 states that "The United States will seek to cooperate with other nations in the peaceful use of outer space to extend the benefits of space, enhance space exploration, and to protect and promote freedom around the world." It was a bit more idealistic than the 1959 version, but not at all incompatible with it -- or for that matter with the Clinton era goal to "Promote international cooperation to further domestic, national security and foreign policies." The consistent theme of US space policy has been to use international cooperation as one tool -- among others -- to enhance American national power. Rebuilding America's space power in the 21st century is not going to be cheap or easy, but it is absolutely essential if we care about preserving our security and our values.

### Lack of leadership crushed security, commitment, and global image.

Bishop, 10 (Rob, “Space cuts short-sighted”, Rob Bishop is Utah's representative from the 1st District, February 25th, 2010, Access Date\_7/15/11).

A report to Congress last year pointed out that delays in the NASA Ares program could have "significant negative impact" on the industrial base for missile production. If delays are "significant" an outright cancellation would be overwhelming. We will lose not just our capabilities for space exploration, but our capability to protect our homeland. Our nation will be less secure. Maintaining leadership in space and creating jobs is important, but fulfilling our constitutional duty to provide for the common defense is an absolute must.

## Leadership Solves – Chinese Rise

### US Space leadership key to monitoring China’s ambition.

Quigley, 09 (Erik N., “GEO-POLITICAL CONSIDERATIONS TO CHINA‘S RISE IN SPACE POWER”, Advanced Space Research Elective Advisor, April 2009, Access Date\_7/14/11).

Once a solid revised national strategy, robust space acquisition funding levels, and GCC contingency plans are in place, US decision makers and warfighters need to know when and how to best employ them. To help dictate the execution of a solid national strategy and application of US space power, US leadership must gain and maintain a constant sight picture into China‘s true military space ambitions. In a similar light with current US national strategy‘s predominant theme of economic cooperation and partnering with China, US leadership should also push for open and honest international dialogue on space capability.

## Plan Solves Space Leadership

### US must colonize to maintain leadership

Billings ‘6

(Linda, research professor at George Washington University*, How shall we live in space? Culture, law and ethics in spacefaring society,* Space Policy 22 Issue 4, November 2006, DA:7/16/11, MadSu)

Today's US civilian space program, borne of the 20th century Cold War, is focused on planning for a new round of human missions to the Moon and, later, perhaps, to Mars. These plans are intended to realize a ‘vision’ for 21st century human exploration articulated by President George W. Bush in January 2004 [1]. The US National Aeronautics and Space Administration (NASA) promotes its plans for a new round of human exploration as a way to maintain US leadership in space. Critics argue that the cost of such missions may be prohibitive in the current fiscal environment [2] and [3], and curious observers keep asking: why are we going back to the Moon? Since the turn of this century China has launched people into Earth orbit and announced plans for human missions to the Moon. NASA is phasing out its Space Shuttle system and developing a new crew and cargo transport system but, given the cost and complexity of this enterprise, the USA may be without its own means of human access to space at some point in the next decade, perhaps for several years. Russia has an operating human space flight system and is also developing a new human-rated space vehicle that government officials have said might begin flying as early as 2013. Canada, India, Japan, and member countries of the European Space Agency (ESA) are among nations interested in collaborating on human missions to the Moon and Mars. Still more nations—some with their own capabilities to build satellites, robotic spacecraft, and unpiloted space launch vehicles, some without any space capabilities of their own—would like to have a role in the global enterprise of space exploration and development.

### US must commit to leadership in space or else others will usurp

Griffin ‘5

(Michael, NASA Space Adminstrator, speech, “Leadership in Space,” <http://www.spaceref.com/news/viewsr.html?pid=18901>, speech made 12/2/05, DA: 7/16/11, MadSu)

Today, as other countries renew their commitment to space, America has the opportunity, and I would argue the obligation, to maintain our leadership role in space exploration. As we watch other countries commit to developing new exploration systems and technologies to expand into space, we too must remain committed to new advancements, lest we fall behind. In that regard, it may be significant to note that, of today's major spacefaring powers only Russia and China have spacecraft - Soyuz and Shenzhou - that are capable of returning crews from a trip to the Moon. Through the Vision for Space Exploration however, this country has a renewed commitment to maintain our leadership and restore the capabilities we set aside many years ago. The vote by two successive Congresses to support the Vision for Space Exploration outlined by President Bush two years ago offers wonderful evidence of national determination to regain lost ground in space. But beyond those very important congressional votes, there are some very serious challenges that we must face as a nation. We must think carefully about what the world of tomorrow will look like if the United States is not the preeminent spacefaring nation. And if we don't like that picture, if we truly want the United States to be the world leader in space now and in the future, there are a number of critical things we simply must decide to do. The Vision gives us the opportunity to take on the leading role in the exploration of space, not just for this century, but for centuries to come. But we have to seize that opportunity, and make it a reality. The first essential step is that American leadership in the exploration and development of the space frontier must be an explicit national goal. There must be continued and sustained bipartisan cooperation and agreement on the importance and necessity of American leadership in space, just as we are determined to be leaders in other areas such as defense, education, and scientific research. There need not, indeed there must not, be partisan debates over whether to have a vibrant space program or not. And we must get beyond revisiting this determination each year, or after an accident, or after a technical problem. In addition to needing national agreement on the importance of American leadership in space, we need to make this a commitment from generation to generation. Space exploration by its very nature requires the planning and implementation of missions and projects over decades, not years. Decades of commitment were required to build up our network of transcontinental railroads and highways, as well as our systems for maritime and aeronautical commerce. It will be no quicker or easier to build our highways to space, and the commitment to do it must be clear and sustaining. To ensure the success of the space program across a wide spectrum of political thought and down the generations, it is essential to have simple but compelling goals. The space community has an obligation to communicate to the country our plans to ensure America's leadership in space exploration. The President's Exploration Vision has established goals that people can understand and support - moving our space exploration activities beyond low Earth orbit, and returning to the Moon as a stepping-stone to Mars and other destinations beyond, such as the near-Earth asteroids. Broad support for these goals is certainly there. A recent Gallup poll indicated that, with funding levels at or below 1% of the Federal budget, three-quarters of Americans are supportive of our plans to return to the Moon and voyage to Mars. This is amazingly strong support for any government initiative, and I believe it provides a firm foundation upon which to build in the years ahead. The first step might be to explain that, actually, we're spending only 0.7% of the Federal budget!

### Colonizing space key to US repairing space dominance. Zey, 10 (Michael, “As US Abandons Manned Flight, China, Russia, Europe Train For Space Colonization with Mars500”, renowned and thought-provoking keynote speaker on a variety of social, economic, technological, and political trends For over two decades he has keynoted various conferences, professional meetings, and trade shows for organizations such as AT&T, United Technologies, United Airlines, Dow Jones, and the World Future Society, June 7th, 2010, Access Date\_7/16/11).

Sadly, it appears that Obama plans to expend little energy or resources on the space program for the remainder of his term. He will provide the occasional “vote of confidence” to private companies such as SpaceX when they successfully launch rockets they have constructed. However, while SpaceX’s recent successful launch of Falcon 9 is laudable, many have suggested that the company was merely replicating technological feats NASA achieved half a century ago. The Mars500 program must serve as a wake-up call to the administration and the American public that the rest of the world is about to venture “where no man has gone before,” and leave America in its “space dust” in the process. The next Congress must pressure the President to reconsider his decision to decelerate the US space program, and convince him to begin the process of restoring the American space program to its former glory.

### Making new advancements in space, key to US space leadership. Hoffman, 11 (Michael, “Boeing Chief: U.S. Should Lead in Space Tech”, Defense News, April 8th, 2011, Access Date\_7/16/11).

James Albaugh, Boeing president and chief executive, warned that the United States risks losing a leadership role in space if Congress and military leaders don't reinvest in new space technologies over the next decade. "We can't afford the so-called rebuilding years of our space capability," he said during an April 8 speech at the National Space Symposium, here. "The next decade must be about reaffirming our leadership role in space."

### American must advance in space exploration to get the edge on space leadership.

Stone, 11(Christopher, “American Leadership in Space: leadership through capability”, Space policy analyst and strategist from Washing D.C., March 14th, 2011, Access Date\_7/13/11).

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”

### US taking action boosts space leadership.

Newsleaks, 11 (“End of Space Shuttle End to US Dominance of hegemony in Space”, July 6th, 2011, Access Date\_7/13/11).

The White House needs to back up a bit and take a look at history and the very reason why America was the first to reach the moon, and that was the Cold War. About the time rocketry was reaching the ICBM level, the Soviets launched Sputnik 1, the first orbiting satellite in October of 1957. The so-called "space-age" was born and the United States found itself lagging in the effort. If at first the Soviets' intentions were to upstage the United States on the high-frontier, as the Air Force called it, the communist bloc soon began to explore the military aspects of space, at first in near-Earth orbit. The Soviet Union is dissolved, replaced by the Russian Federated Union. Fifty-three years later, after the United States outstripped the Soviets, thanks in particular to President John F. Kennedy, in the space race through the highly successful Apollo lunar program, the United States turns away from NASA and to the Russian space launch program to ensure the resupply of the space station, what an irony; and an embarrassment.

### The US must make efforts in space to maintain leadership.

Olson, 10 (Pete, “US must remain the global leader in exploring space”, Congressman from Texas, May 4th, 2010, Access Date\_7/14/11).

The president has a voice in this process, but he does not have the final say. His budget was rolled out without congressional consultation, and I think it is fair to say the administration has learned that was not the ideal way to handle a program that means so much to so many. Constellation is the program of record that has hit many milestones for success and can maintain America’s dominance in human space flight. Several of my colleagues have joined with me in requesting that NASA find the means within their budget to continue Constellation. We in Congress should support that request by providing adequate resources for this program. America must remain the global leader on human space exploration. I remain committed to working with the president and my colleagues to make this happen.

### US must work to maintain international leadership in space.

Stevens, 07 (Robert, “The Next 50 years of US Space Leadership”, Chairman, President & Chief Executive Officer, Lockhead Martin Corporation, April 10th, 2011, Access Date\_7/14/11).

And not just in defense. Space systems now support almost all our modern conveniences – everything from cable TV to cell phones to ATMs and, as such, underpin the strength of our economy. Even as tools like GPS have military applications, they also allow farmers to do precision seeding of their crops… rescue teams to locate miners trapped underground… and families driving in their cars to get help when an emergency strikes. Search and rescue sensors on NOAA’s environmental satellites have helped save thousands of lives. And few Americans appreciate just how many inventions grew out of space technology – from kidney dialysis machines… to smoke detectors… cordless tools… and even the Statue of Liberty’s protective coating. Finally, and to me, maybe most importantly, American leadership in space has long symbolized our leadership on Earth. I believe this is so because there is a simple, basic, common experience among all people, of almost all ages – to look into the night’s sky and wonder what’s beyond. As successful cosmic voyagers, Americans accomplished feats that others only dreamed of, earning global recognition and prestige that served us across all our global pursuits. Over the years we may have grown somewhat accustomed to U.S. predominance in space… but that role has never really been guaranteed. And today, we see increasing challenges to our previously unchallenged leadership.

### US needs space achievement to gain space leadership.

Quigley, 09 (Erik N., “GEO-POLITICAL CONSIDERATIONS TO CHINA‘S RISE IN SPACE POWER”, Advanced Space Research Elective Advisor, April 2009, Access Date\_7/14/11).

Therefore, until the US achieves full, open communication with China, US leadership should posture its military counter-space capability along with its political and economic muscle. By doing so, the US can prepare for the worst-case scenario as recommended in a Dec 2007 report to Congress, ―mistrust over space goals and mutual uncertainty should result in the need for worst-case planning.‖33 Furthermore, senior US leaders should re-evaluate their perceptions of China‘s space military threat to avoid contentment with US‘s space superiority. As described best in astro-politics, ―the lack of an enemy in space is most assuredly causing complacency in the United States, stunting the expansion of its space capabilities.‖34 With China‘s aggressive space military build-up, they may be the very ―enemy‖ that wakes up the US space industry.

### US must act on a space policy to maintain leadership.

Schmitt, 09 (Harrison H., “Geopolitical Context of Lunar Exploration and Settlement”, Former NASA Astronaut and PhD. in Physics, July 30th, 2009, Access Date\_7/14/11).

What, then, should be the focus of national space policy in order to maintain leadership in deep space? Some propose that we concentrate only on Mars. This would be naïve and self-defeating. The country is simply not technically ready to go to Mars at present, and it will be a long time until we are ready to do so. Returning to the Moon, however, provides the fastest path for humans to go to Mars. Without the experience of returning to the Moon, we will not have the engineering or physiological insight for many decades to either fly to Mars or land there. Without lunar water resources, radiation protection for the long voyage to Mars may not be possible. Without the development of lunar helium-3 fusion technology applied to interplanetary propulsion, we may not be able to reduce the transit time to Mars to an acceptable duration. Without lunar operational experience, including learning to operate outside of communications with Earth, we vastly increase the risk of early Martian flights. Without lunar oxygen and water, Earth launch payloads to Mars may be prohibitively large and expensive, not to mention the continued uncertainties about sustainable resources on Mars. Without lunar rocket fuel resources, that is, hydrogen, oxygen and/or methane, we may not be able to land on Mars because of complicating presence of just some atmosphere and not a lot. Indeed, without returning to the Moon, future opportunities of leadership, including a much greater potential for international cooperation in scientific endeavors related to the Moon and beyond, cannot be realized.

### US must work to achieve leadership in space.

Newton, 11 (Elizabeth K., “United States space policy and international partnership”, Professor of Physics – University of Alabama, Former Administrator for NASA, February, 2011, Access Date\_7/15/11).

We should be diligent in monitoring whether the risks and time-delays created by policy change are proven to be worth the benefits, that is, we need to create a ‘closed loop’ on the system, to gauge regularly and systematically whether we are achieving what we want. A vision of American excellence and leadership in security, political economy, and influence provides a framework for this evaluation and for the goals that we set for ourselves. While accountability and data are not beloved in the political process, we will not be able to move beyond debates that the majority of Americans view as arcane, unless we zero in on data-driven evaluations of policy’s performance. Magical thinking might make for good politics, but it makes poor policy.

### Hope for the US to devise new space operations.

Bacchus, 11 (James, “American competitiveness needs space program”, a former Member of Congress, from Florida’s 15th Congressional District, which includes the Kennedy Space Center. He was one of the principal Congressional sponsors of the International Space Station. He chairs the global practice of the Greenberg Traurig law firm, March 16th, 2011, Access Date\_7/15/11).

It is unclear what -- if anything -- will replace the shuttle as a craft for continued human space flight. NASA has rockets that can send robotic probes to explore outer space. But the shuttle was America’s only way for humans to get there. The hope is that retiring the aging and expensive shuttles will free up federal money for developing a new launch system that can take us beyond the low earth orbit of the station -- just 220 miles up -- and into deep space. The heavy lift of a 21st-century spacecraft could take us back to the Moon, on to Mars, and into the beckoning beyond. The hope, too, is that private U.S. commercial space companies have advanced to the point where they can make smaller spacecraft capable of ferrying people as well as provisions to and from the station.

### Push for NASA to begin new projects-regain leadership ground.

Spudis, 11 (Paul, “NASA’s mission to Nowhere”, Paul D. Spudis is a planetary scientist, principal investigator of the Mini-SAR imaging radar on the Chandrayaan-1 mission and author of “The Once and Future Moon”, February 11th, 2011, Access Date\_7/15/11).

NASA falters without specific direction or a stated destination. The history of the agency is replete with research projects disconnected from flight missions that produced no real hardware or technology. Taking five years (or even one year) to “study” the technologies of a heavy-lift rocket is not only pointless - it is destructive. We currently possess all the knowledge, technology and infrastructure necessary to build a heavy-lift launch vehicle. In a logical and effective space program, a mission is chosen, a plan for accomplishing the mission is developed, the flight hardware needed to accomplish the plan is identified, and technology is developed as needed to enable the flight hardware. The administration claims it is setting daring goals - the asteroids and Mars - but has posited them so far in the future that no real, focused work needs to be done toward their achievement during this or the next presidential term. Under Vision, we were working on the development of real capabilities, including launch systems, spacecraft and destinations with specific activities and capabilities at these places. If the new path is adopted, we will have exchanged a mission-driven program for a costly stagnation that will take us nowhere. That is the choice before us.

### Application of new tech- key to US space progress and dominance. Crisostorno, 10 (Christian, “NASA's Constellation Program Planning To Take Initiative For Moon Colonization”, Researcher for Open Talk Magazine, November 12th, 2010, Access Date\_7/16/11).

The Constellation program started as a planned successor to the Apollo program. It is a multi-faceted project that concentrated on three primary factors: the need to apply improved technologies to current spacefaring technology, the need to go beyond the current achievements in space travel and the need to initiate research to eventually colonize other planets. The program was literally meant to be taken as a first step towards the future human exploration of the entire interplanetary neighborhood. Application of advanced 21st century technology would be crucial for the Constellation program’s success. On the navigation and safety part, the Orion crew module and the Altair lunar module will be installed with the most advanced computers to aid astronauts in their journey. Spacesuits will be redesigned and redeveloped to provide astronauts with highly improved mobility during extra-vehicular activity. Numerous fail-safe devices are to be installed to ensure the safety of the crew; even if the mission doesn’t turn out to be a success. Various systems are also slated for research and improvement to make the astronauts’ stay at the moon better and much more pleasant.

## Plan Popular

### Americans want US to maintain Space Leadership role.

Carreau, 11 (Mark, “Majority Views US Space Leadership As Essential”, Aviation Week, July 7th, 2011, Access Date\_7/14/11).

HOUSTON — A majority of Americans – even in the midst of a battered economy – believe it is essential for the nation to stand at the summit of space exploration, according to a new Pew Research Center poll. The survey, released three days before the scheduled July 8 launch of NASA’s final space shuttle mission, suggests that support largely cuts across economic and educational boundaries as well as political affiliation. The findings hint at a bedrock national confidence that space exploration has a positive influence on science and technological achievement in the U.S. and the belief that all Americans derive at least some benefit from the risky pursuit. The survey also found that a small majority of citizens believe that NASA’s 30-year shuttle program has been a good investment. The issue has been a popular topic of news media reporting and commentary as the shuttle Atlantis and a crew of four astronauts prepare to fortify the International Space Station for the transition to commercial resupply and crew transportation.

# Solvency – Feasibility

## 1AC – Solvency

### Colonizing space is feasible in the status quo.

NSS ‘11

(National Space Society, non-profit space organization, “Space Settlement,” <http://www.nss.org/settlement/>, 5/17/11, DA: 7/15/11, Madeline)

“The people of Earth have both the knowledge and resources to colonize space.” That was the stated conclusion of this NASA-sponsored study — in 1975! There are two things you need to know about space settlement: We can do it, starting now. A future with space settlements is vastly better than one without them .When the first person landed on the Moon in 1969 after only eight short years of intense effort, the National Aeronautics and Space Administration (NASA) proved that we could do nearly anything we put our minds and resources to that is consistent with the laws of physics. A few years later, Princeton physicist Gerard O'Neill and others showed that large orbital space settlements would fall within the laws of physics [Refs. 1-4]. Dr. O'Neill's analysis strongly suggested that asteroids and lunar mines could supply the materials, the Sun could provide the energy, and that our technology had nearly reached the point where we could build space settlements. These communities could be placed almost anywhere in the solar system. In 1990, Robert Zubrin and David Baker described a program called Mars Direct, an innovative approach to beginning the settlement of Mars. Zubrin's 1996 book The Case for Mars [Ref. 5] went on to outline a long term program to bring Mars to life with a vibrant human civilization. While certainly difficult, every step in this program is also achievable within the laws of physics. Many plans for space settlement have been proposed — in orbit, on the Moon, on Mars, the asteroids, or elsewhere. All are extremely difficult and expensive, but not much more difficult and expensive than things we have already done. After all, construction of today's civilization was a mighty task indeed. However, if we are going to spend an enormous amount of time, effort, and money on something, we'd better know why. A Better Future There are many reasons to move into space: growth, wealth, energy, survival, spiritual development, knowledge, diversity, to solve serious Earthly problems, to fulfill a sense of destiny and responsibility, and even to have fun. All of these boil down to a simple fact: A future with space settlement is vastly better than one without it. This flows from another simple fact: There are far, far more resources in space than on Earth. For example: The largest asteroid, Ceres, has enough material to build orbital space settlements with a total living area well over a hundred times the land area of the Earth. One smallish asteroid, 3554 Amun, has about $20 trillion worth of metals [Ref. 6, page 112]. There are tens of thousands of asteroids. The energy available for space settlements exceeds 2 billion times the total energy currently used by humanity. There are potentially profit-making industries: space tourism, space solar power, space materials, and others that can pave the path to the first self-sustaining space settlements. Furthermore, we more-or-less know how to exploit these resources without hurting anyone, oppressing anyone, or harming any living organism for the simple reason that there aren't any living things there — it's just rock and radiation, both of which are usable (and valuable) resources. We can bring life into space at great advantage to those who dare try, as well as to humanity as a whole. “Clarke's Law” Arthur C. Clarke, inventor of the concept of using geosynchronous orbit for communication satellites, once wrote that new ideas like this pass through three stages: Stage 1: "It can't be done." Stage 2: "It probably can be done, but it's not worth doing." Stage 3: "I knew it was a good idea all along!" When Clarke first published his idea of utilizing geosynchronous orbit in 1945, that idea was in Stage 1 because it was technically impossible to do so at the time. Today, of course, that idea is in Stage 3, and our television programming and phone calls routinely go through geosynchronous satellites. The idea of building space settlements moved past Stage 1 in the 1970s, as this website will amply demonstrate. For the past couple of decades we have been stuck in Stage 2. Stage 3 is reachable within the lifetimes of those now living.

### U.S. government action is key to immediate construction

Edwards 07 (Bradley, Director of Research-Institute for Scientific Research, worked at Los Alamos researching advanced space technologies for 11 years, Space Elevator: Expert Q&A, Jan 16, http://www.pbs.org/wgbh/nova/space/edwards-elevator.html)

Q: I keep hearing that there is a time frame of about 15 years before we have a working space elevator. I believe this time could be shortened if the country was mobilized behind this concept the way we were in the '60s for the Apollo program. Is the President of the United States even aware of how important the elevator is to the future of space travel? Jane Montgomery, Fort Worth, Texas Edwards: Yes. With a mobilized effort, we could have the elevator up quickly, even sooner than in 15 years. There are several options on how to do this, including the U.S. government getting involved. I am sure the President knows of this project, but I am sure that it is not seen as a priority or a good political move—it could be risky and require more spending. Our society focuses on the "now," and the elevator is critical for our future—a poor match.

### Space elevator will be operational in a few years

Edwards 03, (Bradley C. Edwards, Ph.D., Eureka Scientific, The Space Elevator NIAC Phase II Final Report, <http://www.isdc2007.org/resources/library/spaceelevator/2003-SpaceElevator-NIAC-phase2.pdf>)

Prior to our effort little quantitative analysis had been completed on the space elevator concept. Our effort examined all aspects of the design, construction, deployment and operation of a space elevator. The studies were quantitative and detailed, highlighting problems and establishing solutions throughout. It was found that the space elevator could be constructed using existing technology with the exception of the high-strength material required. Our study has also found that the high-strength material required is currently under development and expected to be available in 2 years. Accepted estimates were that the space elevator could not be built for at least 300 years. Colleagues have stated that based on our effort an elevator could be operational in 30 to 50 years. Our estimate is that the space elevator could be operational in 15 years for $10B. In any case, our effort has enabled researchers and engineers to debate the possibility of a space elevator operating in 15 to 50 years rather than 300.

## A2: No Food Sustainability

### Special greenhouses in space sustain vegetation

Space.com ‘10

(SPACE.com, latest space and science news agency, “Lunar Greenhouse Could Grow Food For Future Moon Colonies,” <http://www.space.com/9353-lunar-greenhouse-grow-food-future-moon-colonies.html>, 10/19/10, DA: 7/13/11, Madeline)

A new collapsible "greenhouse" could be the key to growing fresh and healthy food to sustain future lunar or Martian colonies, a recent project found. Scientists at the University of Arizona's Controlled Environment Agriculture Center (CEAC) are experimenting with growing plants without the use of soil. Instead, they are trying to demonstrate that potatoes, peanuts, tomatoes, peppers and other vegetables can be grown in only water a process known as hydroponic growth. The team built a prototype lunar greenhouse in the CEAC Extreme Climate Lab that is meant to represent the last 18 feet (5.5 meters) of one of several tubular structures that would form part of a proposed lunar base. The tubes would be buried beneath the moon's surface to protect the plants and astronauts from deadly solar flares, micrometeorites and cosmic rays. As such, the buried greenhouse would differ from conventional greenhouses that let in and capture sunlight as heat. Instead, these underground lunar greenhouses would shield the plants from harmful radiation. Greenhouse basics The membrane-covered greenhouse module can be collapsed down to a 4-foot-wide disk for easy storage during interplanetary travel. It would be fitted with water-cooled sodium vapor lamps and long envelopes that would be filled with seeds, primed to sprout hydroponically. "We can deploy the module and have the water flowing to the lamps in just ten minutes," Phil Sadler, president of Sadler Machine Co., which designed and built the lunar greenhouse, said in a statement. "About 30 days later, you have vegetables." The contraption will rely on robot-like components to grow its organic life. Algorithms to analyze data collected by attached sensors and a control system to optimize performance are in the works. "We want the system to operate itself," said Murat Kacira, an associate professor of agricultural and biosystems engineering at the University of Arizona. "However, we're also trying to devise a remote decision-support system that would allow an operator on Earth to intervene. The system can build its own analysis and predictions, but we want to have access to the data and the control system." In fact, the engineers can take cues from an existing analog on Earth a similar CEAC food-production system has been operating at a South Pole research station for the past six years. The South Pole Growth Chamber, which was also designed and fabricated by Sadler Machine Co., provides fresh food to the U.S. South Pole Station in Antarctica, which is physically cut off from the outside world for six to eight months each year. Several ideas used in the development of the lunar greenhouse were inspired by the functioning South Pole Growth Chamber. Other applications Another important aspect of the greenhouse design is the effective and efficient use of resources, which would be crucial on a lunar base. "On another planet, you need to minimize your labor, recycle all you can and operate as efficiently as possible," said principal investigator and CEAC director Gene Giacomelli. In developing such a system, there will likely be applications for our planet as well, he said. "All that we learn from the life support system in the prototype lunar greenhouse can be applied right here on Earth." Carbon dioxide is fed into the prototype greenhouse from pressurized tanks, but astronauts would also provide CO2 at the lunar base simply by breathing. Similarly, water for the plants could be extracted from astronaut urine, and the water-cooled electric lights might be replaced by fiber optic cable essentially light pipes which would channel sunlight from the surface to the plants underground. Giacomelli said the research could also lead to plant colonization in another traditionally hostile environment, large urban centers. "There's great interest in providing locally grown, fresh food in cities, for growing food right where masses of people are living," Giacomelli said. "It's the idea of growing high-quality fresh food that only has to be transported very short distances. There also would be a sense of agriculture returning to the everyday lives of urban dwellers. I think that idea is as exciting as establishing plant colonies on the moon."

### Agriculture functions space –longer missions show further development in food for future explorations

Nelson and Silva ’9

(Davia Nelson and Nikki Silva, National Public Radio, NPR radio news writers and producers, “Beyond Tang: Food in Space,” <http://settlement.arc.nasa.gov/designer/regen.html>, 6/7/09, DA: 7/13/11, Madeline)

As we go on to longer-duration missions, it makes sense to become a little more self-sufficient with our food. The ultimate way of doing that is growing crops and processing them into food. "On the outpost of the moon as well as Mars, it is very likely we will grow vegetables and fruits, and then we'll have a real galley because you've got 1/6th gravity for the moon or 3/8th gravity for Mars, so you can actually prepare foods and not be eating out of packages all the time. "We'll also start looking at bringing up in bulk items like wheat berries or soybeans and then processing those into edible ingredients, like with the wheat berries we'd make wheat flour and then we'd be able to do pasta or cereal or breads. The food itself probably won't change a whole lot. As the missions grow longer, the food lab's attention will be directed to longer shelf-lives and growing ingredients," Perchonok says. NASA continues to collaborate with scientists, students, inventors and innovators around the world as it works toward its goal of a manned flight to Mars.

### Crops in space provide food and convert toxic CO2 to Oxygen

Heiny ‘4

(Anna, National Aeronautics and Space Agency correspondent/scientist, executive space agency, “Farming for the Future,” <http://www.nasa.gov/vision/earth/livingthings/biofarming.html> 08/27/04, DA: 7/13/11, Madeline)

Unlike travelers on Earth who have the convenience of roadside diners and fast-food restaurants, the dining options for space travelers are limited. As NASA's astronauts prepare to fulfill the Vision for Space Exploration with increasingly lengthy missions, scientists are trying to find a way for them to grow their own food. Plants offer a promising solution in providing food to astronauts thousands of miles from Earth. They could grow crops that would not only supplement a healthy diet, but also remove toxic carbon dioxide from the air inside their spacecraft and create life-sustaining oxygen. Since the Space Shuttle and even International Space Station expeditions are relatively short-duration endeavors, astronauts do well with physical and chemical forms of life support. But for future long-duration missions and colonies on the Moon or Mars, scientists believe a life support system with a biological component (such as plants) -- called a "bioregenerative life support system" -- has several benefits. "If you continually resupply and deliver commodities like food, that will become much more costly than producing your own food," says Ray Wheeler, plant physiologist at Kennedy Space Center's Space Life Sciences Lab. "You can achieve some autonomy with bioregenerative capability."

## **A2: No Reproduction in Space**

### **Reproduction Able -Microgravity increases sperm motility to egg**

Tash ‘2

(J.S., NASA Exploration Systems Mission Directorate Education Outreach writer, “Will Space Travel Affect Reproduction?,” [http://weboflife.nasa.gov/currentResearch/currentResearchFli ght/seaUrchin.htm](http://weboflife.nasa.gov/currentResearch/currentResearchFli%20ght/seaUrchin.htm), June 2002, DA: 7/13/11, Madeline)

Colonizing other planets and living and working in space for entire lifetimes were once the stuff of science fiction, but these days spaceflight itself has become somewhat routine, and space stations (Skylab, Russia's Mir, and recently the International Space Station) have provided people with the opportunity to live and work in space for extended periods of time. People now speculate that the ability to explore and colonize other planets is simply a matter of time. But some practical issues that go with traveling to and inhabiting other planets must still be addressed. One of the most fundamental biological questions posed by space travel is that of the effects of microgravity on reproduction. Sperm and Serendipity In the course of a literature search pertaining to his research in the field of male reproductive issues and male contraceptives, NASA Principal Investigator Joseph Tash, of the University of Kansas Medical Center, came upon a paper by Ute Engelmann, of Medical Consulting in Munich, Germany, and her co-investigators. The paper described experimental results in which bull sperm motility was increased when subjected to freefall. Tash's discovery of the Engelmann article coincided with a NASA announcement seeking research proposals for studying the effects of microgravity on the ability of species to reproduce, and Tash believed that his own research would benefit from a microgravity environment, so he submitted a research proposal. Tash was interested in signal transduction, the process by which sperm are "told" to travel toward and fertilize an egg. He says, "We proposed to examine whether the signal transduction associated with the activation of sperm, and also the signaling that occurs in the sperm in association with signaling from the egg, were altered under the effects of microgravity." The proposal was selected for further ground-based studies and subsequently for flight studies. Sperm vs. Eggs Tash and his co-investigators chose to study sperm not only because that was where Tash's initial research interest lay, but also because sperm are very easy to collect, store, and study without affecting their function. With eggs, it's difficult to assess possible changes in their function resulting from the effects of microgravity without first fertilizing them. Notes Tash, "With sperm, you don't have to do that in order to get a good idea of whether they're working or not." Sperm cells are considered to be terminally differentiated cells. They have just two functions: moving, and fertilizing the egg. Fertilization is not possible without sperm movement, so studying the fundamental ability of sperm cells to move is a relatively simple way of assessing sperm functionality. For his research, Tash chose to use sea urchin sperm because the sperm are more uniform than sperm obtained from humans or other mammals, but their function and mode of movement are very similar to those of sperm from higher species. Tash notes that sea urchins are a long-standing, widely used model for studying the biology of fertilization. Common genetic origins, or homologies, between the sea urchin system and mammalian systems make the sea urchin a good model for obtaining basic information that can point to important questions to be addressed by studying mammalian systems. Sea urchin sperm also provide the added benefit of survivability - they are able to tolerate delays that sometimes occur with flight research. First Steps To send the sperm into space, Tash and his co-investigators used the European Space Agency's (ESA's) Biorack facility, a multiuser biological research facility originally designed for shuttle missions. The investigators were supplied with the hardware a year ahead of time. They used this period to demonstrate that the hardware itself did not affect the outcome of their studies and that they could ask and answer the questions they wanted to before the experiment was manifested. "I think that's a real critical component of why we were so successful," says Tash. A key aspect of the experiment was that the sperm were not in an active state - that is, they were not moving - when they were sent into orbit aboard the space shuttle. During fertilization in sea urchins, activation of the sperm occurs in less than a minute. Sperm are activated by a chemical process called phosphorylation, which sets off reactions within the sperm cells that start them swimming toward an egg. A separate chemical process stops sperm movement. During their preflight experiments, the researchers proved that the sperm could be collected and maintained in an inactive state for at least 20 hours before launch until the beginning of the experiment, which occurred a minimum of 20 hours after launch. This preflight research involved developing new technology for sperm storage, which led to a patent for the team. The researchers have been able to adapt the technology for sperm from different species, and they hope that the technology will find application in the agriculture industry, specifically for the collection, storage, and transport of semen for use in breeding, such as when a farmer wishes to breed his cattle to a bull that is located in another part of the country. A Moving Experience The experiment involved looking at specific proteins associated with sperm motility. Sperm were held in chambers in the Biorack; each chamber held experiment hardware for six samples of sperm, and there were two chambers for each of the time points at which the sperm were examined (0, 30, and 60 seconds). Once the sperm were activated by the introduction of seawater, their movement was stopped at either 30 seconds or 60 seconds. The researchers were then able to use antibodies to compare how the proteins associated with motility changed at each of the time points. "During our ground-based studies we found that two key sets of proteins, called FP 130 and FP 160, were likely associated with dynein, the main motor protein that is responsible for sperm tail movement," explains Tash, referring to a paper he published in Biochemical and Biophysical Research Communications in 1998 (see below for full reference). "These proteins are phosphorylated [a phosphorous group is attached to them] during activation of sperm, which starts the whole chemical cascade within the sperm cell that leads to onset of motility. Under microgravity conditions, the phosphorylation of FP 130 and FP 160 occurred much more rapidly than it did under normal-gravity conditions," says Tash. This result is consistent with those obtained from the earlier sounding rocket experiments conducted by Engelmann. The researchers learned that the sperm will begin to move sooner and will move more rapidly in space than they will on Earth,

### Microgravity and hypergravity don’t prevent fertilization

Miller ‘5

(Karen, NASA Exploration Systems Mission Directorate Education Outreach writer, “Floating Fertility,” <http://weboflife.nasa.gov/currentResearch/currentResearchBiologyGravity/floatingFertility.htm>, 3/24/05, DA: 7/13/11, Madeline)

The puzzling behavior of space-faring sperm first attracted attention in 1988 when the German researcher U. Engelmann sent samples of bull sperm into orbit aboard a European Space Agency rocket. His goal, in that and a later experiment, was merely to determine whether changes in gravity affected the motility (movement) of sperm. He found that it did. The tiny cells appeared to move better in a low gravity environment -- good news, it seemed, for fertilization, which is closely tied to sperm motility. Perhaps making babies would actually be easier in space! But, says Tash, who has studied the sperm of sea urchins on board NASA shuttle flights, it's not so simple. Sperm movement, he explains, begins with a process called phosphorylation -- a chemical reaction widely used by cells to control their own activities. In phosphorylation, an enzyme changes the functioning of a protein within a cell. This sets off a kind of domino chain reaction that starts some type of activity -- like causing the tails of sperm to move, and to propel the sperm cell forward. On Earth, the tail movement is halted or modified when a second enzyme, known as a protein phosphatase, kicks in. In microgravity, Tash found that the second enzymes don't do their job within the normal time period. Above: The behavior of sperm -- a basic biological process -- is affected by gravity. Image Credit - Dr. J. Tash, University of Kansas Medical Center. Although his results may explain why sperm move faster in space, they don't necessarily imply that fertilization will be easier. After all, if one enzyme (protein phosphatase) isn't activated properly perhaps others will be affected, too. Many enzyme reactions play a role in the fertilization process: for example, to ready the sperm to insert the DNA into the egg. Says Tash: if enzyme processes are being altered by gravity -- and they are -- you can't even guess at the effect on fertilization until you've studied more than just sperm movement. Tash conducted his initial research using the European Space Agency's Biorack Facility on board shuttle missions STS-81 and STS-84. "Those were part of the MIR docking flights," he explains, "and there was no room for microscopes. Although we wanted to, we could not actually look at the sperm motility itself." As it turned out, doing without microscopes led to unexpected benefits. They were forced to concentrate instead on the proteins that are connected with the process. "As a result," says Tash, "we were able to identify [previously-unknown] proteins in the sperm tail that are very tightly coupled to the initiation of sperm movement." More recently, Tash has studied the effects on sperm of hypergravity (greater than normal gravity). Working with a centrifuging microscope in Germany, he was able to examine activated sea urchin sperm under conditions up to 5 G (five times normal Earth gravity). His findings expanded on the results of the shuttle experiments. On the shuttle, Tash explained, researchers examined the proteins by activating millions of immotile sperm and then, using antibodies, looking at the way the proteins had changed 30 and 60 seconds later. With the centrifuging microscope, "we were actually taking measurements of individual sperm cells." Following each of the unique wrigglings of hundreds of individual sperm, Tash found that sperm motility begins to deteriorate at as little as 1.3 Gs. And, he found, in hypergravity fertilization itself is reduced by a full 50%.

## A2: Gravity

### Artificial gravity develops –allows for space colonization and preserves health

ThinkQuest ‘0

(ThinkQuest, online teacher resources website, “Artificial Gravity,” <http://library.thinkquest.org/C003763/index.php?page=adapt06>, 2000, DA: 7/14/11, Madeline)

Artificial Gravity While the concept of simulating gravity in space ships has existed in science fiction for some time, artificial gravity systems have only recently become a topic of serious scientific investigation. The manned exploration of space has so far been limited to the moon and low Earth orbit. During missions that last only a few weeks or months, the adverse effects of weightlessness on the human body are not a huge annoyance. However, once mankind ventures beyond the moon to destintations like Mars, the length of time humans would be exposed to zero-gravity increases drastically. The consequences of extended exposure to weightlessness are undesirable physiological adaptations that impede the ability of astronauts to function efficiently upon the return to an environment with gravity. Although countermeasures such as diet and exercise can be taken to fight these physiological adaptations, they are not entirely effective. The perfect solution would be to create artificial gravity, which would allow humans to maintain their health in space. While the concept of simulating gravity in outer space has existed in science fiction for centuries, artificial gravity systems have only recently become a topic of serious scientific investigation. In 1923, scientist Hermann Oberth described how two space vehicles could be attached together with a strong cable and spun around their common center of mass. This essentially creates a giant centrifuge, with the contents of the centrifuge experiencing centripetal acceleration towards the outside of the centrifuge. By making adjustments to the angular velocity of the rotating space ships, the centripetal acceleration can simulate Earth gravity (1G) within these space ships. The strength of the simulated gravitational force generated by the centrifuge system depends on the length of the spin arm and the number of rotations the system makes per minute. The length of the spin arm is measured from the centre of gravity of the two space vehicles and the outer edge of one of the space vehicles. If you visualize a circle with the cable being the diameter and the circumference being the path followed by the two space vehicles rotating around the center of mass, then the length of the spin arm is the radius of that circle. By playing around with these two variables (the spin arm length and the number of rotations per minute) you can simulate a variety of G-forces within this artificial gravity system. The Stanford Torus The Stanford Torus is a prototype design for a space colony that was the brainchild of a team of scientists, university professors and engineers that was directed by Gerark K. O'Neill. In ten weeks, this team came up with a meticulous plan for a futuristic industrial town that orbits the Earth. The shape and design of the Stanford Torus (which bears a remarkable resemblence to a cosmic doughnut) is perfect for creating artificial gravity. Spinning the torus like a giant centrifuge generates centripetal acceleration toward the exterior. This centripetal acceleration feels just like gravity to the inhabitants of the colony. Constructing a Stanford Torus today would be a nearly impossible project because of the advanced technology and copious funds that are necessary. Nevertheless, it may only be a matter of centuries before the space colonies of science fiction become science fact. Photo courtesy Space Settlement There are two possible methods of simulating Earth gravity in a space ship. One way is to use a high speed of rotation and a short spin arm. Although this method is cost efficient because less raw material is needed to construct it, it has a number of serious drawbacks. High speeds of rotation are extremely uncomfortable for humans. Studies have shown that humans can tolerate rotations of 2 rpm without much discomfort, but when the number of rotations per minute exceeds two, people develop debilitating motion sickness. Another drawback with this design is the gravity gradient that is created when a short spin arm is used. A gravity gradient is present when the pull of simulated gravity at one point is different than the pull at another point. Depending on the length of the spin arm, people may literally be lightheaded because their head will weigh less than their lower body. Artificial gravity has already been shown to preserve the health of organisms in space. The other way to simulate gravity in space is by using a long spin arm and a slow rotation. This design requires a huge space station that would be extremely costly, but it is advantageous in that it creates a much more Earth-like environment than that created by using a fast rotation and a short spin arm. Using the ideal rotation of two rotations per minute, Earth gravity can be simulated by having a spin length of approximately 223 metres. This system is superior because humans living in it do not experience any disorienting side-effects. A number of popular space station designs, such as the Stanford torus (see table, images), use this system. Artificial gravity has already been shown to preserve the health of organisms in space. Soviet experiments using rats in centrifuges showed that centrifuged rats were much healthier than non-centrifuged rats. Artifical gravity preserved red blood cells and bone density

## A2: Disease and Health Problems in Space

### **Health concerns can be overcome**

White & Averner ‘1

(Ronald White, National Space Biomedical Research Institute and Baylor College of Medicine, Maurice Averner, NASA Ames Research Center,“ Humans in Space,” 2/22/01, DA: 7/13/11, Madeline)

Voyages of exploration will subject space travellers to three serious and related challenges: (1) changes in the physical forces on and within the body brought about by a reduction in weight of the body’s components; (2) psychosocial changes induced by the long-term confinement of such a voyage without the possibility of escape; and (3) changes in the levels and types of radiation in the environment. These changes, which act simultaneously, precipitate a cascade of timerelated events in the human body about which we have been learning slowly for the past 40 years 4 . The integrated and unmitigated responses of the body to these challenges present real risks to the health of the humans undertaking such missions and to the satisfactory completion of the missions themselves. Some of the risks pose a greater threat than others do, and the level of understanding of the physiological responses to space flight varies depending on the body system in question. Fortunately, it seems that most of these risks may be reduced to an acceptable level through a vigorous research programme.

## A2: Difficult Transition

### Earth and Space transition is an easy adjustment for humans-Astronaut proves

Malik ‘8

(Tariq, Senior Editor, “NASA Astronaut Readapts to Life on Earth,” <http://www.space.com/5578-nasa-astronaut-readapts-life-earth.html>, 6/30/08, DA: 7/14/11, Madeline)

American astronaut Garrett Reisman is getting reacquainted with gravity and baseball as he readjusts to life on Earth after three months living in space. Reisman, 40, is looking forward seeing his beloved New York Yankees play the Boston Red Sox in New York on Sunday, just over three weeks after returning on Earth following his 95-day trek to the International Space Station (ISS). I’m looking forward to coming back and having a real slice of pizza, and seeing my friends and family in New Jersey and New York,? said Reisman, a Parsippany, N.J.-native, in a recent televised interview. Reisman launched to the space station in March aboard NASA?s shuttle Endeavour and returned June 14 aboard the shuttle Discovery. Despite months of weightlessness, in which the lack of gravity leads to muscle and bone loss, the first-time spaceflyer was well enough to walk out onto Discovery?s runway and take a close look at the spacecraft after it landed at NASA’s Kennedy Space Center in Florida. It’s been a relatively easy adjustment coming back home and I?m very thankful for that,? Reisman told SPACE.com, adding that even he was surprised by his resilience. I was surprised. I was prepared for the worst. Just three days after setting foot back on terra firma, Reisman received medical clearance to drive his car again, something he expected would take at least a month. It turns out, I am somewhat of a physiological freak, he said with a laugh. It wasn’t perfect, I was still very wobbly. He chalked his success up to regular exercise in space, the fact that his three-month mission was half the length of those flown by his core Expedition 16 and Expedition 17 crewmates and perhaps his short stature, which anecdotal evidence suggested might make a space homecoming a bit easier.

### Humans quickly adapt to gravitational changes

Hsu ‘10

(Jeremy, Space.com contributor, “NASA Uses Fish to Fight Space Sickness,” <http://www.space.com/8007-nasa-fish-fight-space-sickness.html>, 3/5/10, DA: 7/14/11, Madeline)

That works until astronauts return to Earth and become incredibly sensitive when just taking a step or turning their heads. Boyle has seen a similar hypersensitivity in snails that have returned to Earth after launching aboard Russian space missions. Humans' ability to adapt quickly to the feeling of zero-G has proved a blessing for now, even if it baffles scientists. Our species has necessarily adapted to changes in predators and climate throughout history, but there's no obvious reason for why it should adapt so quickly to changes in gravity. "The brain probably begins right away," Boyle said. "It's amazing when you think that for all of human history on Earth, gravity has always remained the constant."

## More Solvency Exts

### Space colonization concerns diminished –it’s feasible

Heppenheimer ‘7

(T.A. Heppenheimer, major space researcher and author, *Colonies in Space,* Copyright 1977, Reproduced 2007, DA: 7/15/11, Madeline)

Perhaps the most important consequence of the Princeton meeting was the creation of a community of interested specialists among the participants, thus broadening the colonization studies well beyond the work of O'Neill and his close associates. There were a number of rather distinguished people among the conferees. Peter Glaser, the inventor of satellite power stations was there, as was Gordon Woodcock of Boeing, who had come up with a different type of design. Eric Drexler was back again, from MIT. But this time he brought along the father-confessor to his group of MIT students studying space colonization—Arthur Kantrowitz, chairman of Avco-Everett Research Labs. There was Edward Finch, former ambassador to Panama, to speak on space law. Assorted NASA officials were there to discuss what would be needed in the way of launch vehicles and how space colonization might fit into NASA plans for the future. A great deal of useful work came out of that conference. There were key technical results involving space transportation, sources of lunar materials, and space power sources, as well as proposals for possible social and cultural organizations in a colony. Agriculture received its share of attention too. Present at the conference were Carolyn and Keith Henson, of Tucson, Arizona. They raise turkeys, rabbits, and chickens on their lot, and get their milk from pet goats. They had come to talk about farming in space, which they proposed to build around—that's right—the raising of rabbits and goats. With the Princeton conference over, attention turned to the forthcoming NASA study, the second major event for 1975. This study was to take place during the entire summer at NASA's Ames Research Center near Stanford University, forty miles south of San Francisco. It was sponsored by the American Society for Engineering Education and represented its annual summer program in engineering systems design. This program was also sponsored by NASA to give experience in systems design to about two dozen members of university faculties chosen from around the country. One of the more noteworthy of these summer studies had been the 1971 effort led by Bernard Oliver. Cyclops, an immense array of radio telescopes to be used in seeking signals from civilizations around other stars, had been designed at this meeting. The study started in the middle of June. Gerry O'Neill was out there for the summer to carry on his regular work in physics at Stanford. But he wound up spending most of his time with the summer study participants at Ames, whose task had been given: "Design a system for the colonization of space." Eric Drexler again came out, this time bringing with him his entire crew of half a dozen students from MIT and Harvard. Several of them turned out to know more than most of the faculty members in the study; they did a great deal of useful work. There was Mark Hopkins, a graduate student in economics at Harvard. His economic studies helped greatly to determine the probable cost of the project ($100 billion) and the economic return from building power satellites (very high). Also there was Larry "Wink" Winkler. Wink, as everyone called him, was particularly interested in the physiological limits to human habitation in space. He was especially concerned with the rate at which a colony should spin to provide artificial gravity. If it spun too rapidly, the colonists would suffer motion sickness. The proposal had been that the first colony should be 600 feet in diameter, rotating at 3 revolutions per minute to give normal gravity. The colony would then be a cylinder a mile long. But Wink's studies showed that there could be trouble if the spin were faster than one rpm. This meant the colony could not be a cylinder but had to be redesigned into the shape of a bicycle tire, the shape known as a torus. This is the classic shape of the space station in 2001. It would be over a mile in diameter with people living on the inside of the "tire," 400 feet wide. The work of the Summer Study cleared up the last major doubts as to the feasibility and practicality of space colonization. It treated in some detail such important matters as space transport of people and material, obtaining and processing metals from the moon, space agriculture, architecture and urban planning for a space community, the economics of colonization, and the provision of radiation shielding for the colony. Toward the end of July, Gerry O'Neill went to Washington to testify before the space-science subcommittee of the House committee on science and technology. This powerful committee had recently extended its influence by taking major responsibilities for the nation's energy policies. Now it was holding hearings on possible new directions for the United States in space. Arthur C. Clarke flew from Ceylon to testify at the hearings. Gerry O'Neill gave an overall review of his work, drawing heavily on the economic studies of Mark Hopkins. Then he went off to a meeting, previously arranged, with Congressman Morris Udall. (Dr. Gerard K. O’Neil, physics professor at Princeton University)

### Humans can colonize space –has resources to support

NASA ‘10

(NASA Headquarters Library, US government space agency, “Space Colonization,” <http://www.hq.nasa.gov/office/hqlibrary/pathfinders/colony.htm>, March 2010, DA: 7/15/11, Madeline)

One of the major environmental concerns of our time is the increasing consumption of Earth's resources to sustain our way of life. As more and more nations make the climb up from agricultural to industrial nations, their standard of life will improve, which will mean that more and more people will be competing for the same resources. While NASA spinoffs and other inventions can allow us to be more thrifty with Earth's treasures, once all is said and done, its raw materials are limited. Space colonies could be the answer to the limitations of using the resources of just one world out of the many that orbit the Sun. The colonists would mine the Moon and the minor planets and build beamed power satellites that would supplement or even replace power plants on the Earth. The colonists could also take adavantage of the plentiful raw materials, unlimited solar power, vaccuum, and microgravity in other ways, to create products that we cannot while inside the cocoon of Earth's atmosphere and gravity. In addition to potentially replacing our current Earth-polluting industries, these colonies may also help our environment in other ways. Since the colonists would inhabit self-supporting environments, they would refine our knowledge of the Earth's ecology.

### Colonies can sustain -Abundant water supply on the moon-provides drinking for colonists as well as fuel and shields cosmic radiation

Bryner ‘9

(Jeanna, Space.com staff writer, “Water discovery fuels hope to colonize moon,” <http://www.msnbc.msn.com/id/33918160/ns/technology_and_science-space/t/water-discovery-fuels-hope-colonize-moon/>, 11/13/2009, DA: 7/13/11, Madeline)

Hopes, dreams and practical plans to colonize or otherwise exploit the moon as a source of minerals or a launch pad to the cosmos got a boost today with NASA's announcement of significant water ice at the lunar south pole. The LCROSS probe discovered the equivalent of a dozen 2-gallon buckets of water in the form of ice, in a crater at the lunar south pole. Scientists figure there's more where that came from. "The presence of significant quantities of ice on the lunar surface catapults the moon from an interesting waypoint to a critical launching pad for humanity's exploration of the cosmos," said Peter Diamandis, CEO and chairman of the X Prize Foundation, which is running a $30 million contest for private moon rovers. "We're entering a new era of lunar exploration — 'Moon 2.0,' in which an international group of companies and governments will use the ice and other unique resources of the moon to help us expand the sphere of human influence, and to help us monitor and protect the Earth." The water discovery firms up previous detections of the signature of water molecules by three independent spacecraft. But the new finding makes more of a splash in that the detections come from both infrared and ultraviolet measurements, and a lot more of it was detected than scientists had expected. "It is a big 'wow,'" said Jack Burns of the Center for Astrophysics and Space Astronomy at the University of Colorado, Boulder, and director of the Lunar University Network for Astrophysics Research. Set up lunar camp Having that store of water on the moon could be a boon to possible future lunar camps. In addition to a source of drinking water, lunar water ice could be broken into its constituent hydrogen and oxygen atoms, ultimately to be used in rocket fuel. That would mean spacecraft ferrying future colonists to the moon would not have to take fuel for the return trip, or the fuel could be used to launch trips beyond the moon. And water could be used as a shield from cosmic radiation. "We now can say ... that the possibility of living off the land has just gone up a notch," said Peter Schultz, professor of geological sciences at Brown University and a co-investigator on the LCROSS mission, referring to past detections of water on the moon. Race to the moon. The new discovery comes just as the Obama administration is deciding whether to continue on with NASA's goal of putting astronauts back on the moon by 2020. Today's news could tip the scales toward another lunar leap. "It's going to boost the interest in the moon, no doubt about it," said with Michael Wargo, chief lunar scientist for Exploration Systems at NASA Headquarters. "It's going to provide additional information that will inform the decision that will inform the future of human space exploration." He added that the new finding will likely be taken into account when that administrative decision is made. "In terms of the clearly most practical destination for the next two to three decades for human exploration it has to be the moon," Burns told SPACE.com

### **Space Colony Self-Sustainable and provides resources**

Orbitec ‘6

(Orbital Technologies Corporation, <http://www.orbitec.com/documents/SSLC_2006.pdf>, December 2006, 7/13/11)

The first purpose of the SSLC is to establish a permanent human presence on the Moon with a minimum need for supplies from Earth. The second purpose would be to serve as a test-bed for technologies that would be in common between the SSLC and an eventual Mars base. The SSLC is intended to fully utilize Lunar resources. The colony would be considered “self-sustaining” when it can achieve the goal of surviving without any supplies from Earth for 52 months. This rep-resents the period a Mars colony would need to survive between supply missions from Earth, assuming one missed re-supply mission opportunity. The SSLC would need to pro duce and recycle all of the consumables required over that time. It must also maintain all of the modules, facilities, and equipment. We have assumed that the SSLC would have a steady-state population of 100. The Lunar colonists are considered to be permanent residents for a minimum period of 52 months. The colony could become self-sustaining without becoming completely isolated from the Earth. For example, scientific and technical equipment needed for further science, exploration, and extension of operations could be supplied. Communications and electronic data transfer with Earth would be extensive. The SSLC would be located at the southern pole of the Moon. There are several reasons to choose this location. First, data from the Lunar Prospector indicated significant amounts of frozen water ice, or at least bound hydrogen, at both of the Lunar poles in cold traps where the Sunlight is severely limited or non-existent (bottoms of craters and depressions). This resource will provide a valuable feedstock for H2O, O2, and fuel to support Lunar surface activities, provide life support consumables, and allow transportation back to the Earth. Second, there are several areas at the South pole that receive near-constant Sunlight. Two locations near the Shackleton crater at the Lunar south pole have been identified that collectively receive sunlight for ~98% of the time, making them excellent sites for the SSLC and the associated Solar power systems. The availability of near continuous power eliminates the need for long-term energy storage. Third, the temperature environment is much more consistent than other non-polar Lunar sites, with few dramatic temperature shifts. Surface temperatures at the south pole remain close to –53 +/- 10 C.

### Humans can live in space-NASA brainstorms for infrastructure

Macintosh ‘11

(Zoe, Space.com Staff writer, “NASA Launches Contest for Inflatable Space Houses,” http://www.space.com/8751-nasa-launches-contest-inflatable-space-houses.html, 7/14/11, DA: 7/4/11, Madeline)

NASA has launched a summer contest for students to design the best inflatable loft for life in space or on another world. A cash reward and a field test of the winning design are up for grabs. Three awards of up to $48,000 each will be granted to the university student teams that produce the best loft-like inflatable space habitats that can be attached to a hard-shell NASA structure. The winner of a head-to-head competition of the modules' performance in the Arizona desert will earn another $10,000, NASA officials said in an announcement. "The idea is that the students will be able to learn about teamship, systems engineering, about the future of design for habitat designs, and also innovative technology like inflatable structures," said NASA space architect and Habitat Demonstration Unit project manager Kriss Kennedy. "We're growing our next generation of engineers and architects. They're actually taking what they're learning in school and applying it." The contest is sponsored by NASA's Exploration Mission Directorate in conjunction with the Office of the Chief Technologist's Innovative Partnerships Program. Building a better space house Though NASA has produced prototypes of inflatable habitats in the past, the space agency now wants to engage and encourage students. "Students will actually be able to be involved in designing and testing these concepts, as we go beyond low Earth orbit," Kennedy told SPACE.com. The winning team will then try out its design in the space agency's 2011 field test campaign in Arizona, or in a similar set of trials in 2012, NASA officials said. In the past, NASA has tested inflatable habitats in Antarctica to support its Constellation program aimed at returning astronauts to the moon. But since the proposed cancellation of that program earlier this year by President Barack Obama, the ultimate target of such equipment designed to foster lunar or Mars exploration is an evolving question. Inflatable homes in space Commercial companies have also experimented with inflatable space habitats. The Las Vegas-based company Bigelow Aerospace has built and launched two inflatable modules (Genesis 1 and Genesis 2) into orbit to test systems and technology for a planned private space station. The company also envisions using inflatable modules to build a private moon base, Bigelow Aerospace officials have said. But NASA work still continues. For example, NASA's Activation Missions Systems Directorate, and the Directorate Integration Office, created lab work stations this year that could occupy a moon or Mars base. "Right now we're looking at a combination of hard and soft structures . We're looking at hybrids," Kennedy said, adding that the agency plans to test fixed habitats later this year. "This year we built a core shell that is a hard structure. It's short and round, more like a tuna can, squat. It's not like a space station module, that is a long cylinder." A medical operations area, and a geosciences lab glove box, were all constructed from a hard shell in contrast to next year's focus on habitats and inflatable structures, Kennedy said

### Scientists look into more solutions of colonization problems, as more research is done, more techniques develop

ESA ‘5

(European Space Agency, “The Future of European Space Exploration,” <http://esamultimedia.esa.int/docs/exploration/StakeholderConsultations/LongTerm_Strategy_Executive_Summary.pdf>, December 2005, DA: 7/14/11, Madeline)

Human exploratory missions, such as the establishment of a permanently inhabited lunar base or human visits to Mars, will add a new dimension to human spaceflight as far as distance of travel, radiation environment, gravity levels, mission duration, level of crew confinement and isolation are concerned. In addition to these significance health issues, resource management and advanced life support systems will require innovative solutions, such as ESA's MELISSA (Micro-Ecological Life Support Alternative), which is intended to produce food, water and oxygen from organic waste. Key issues of life sciences that must be addressed prior to the design of lunar and Mars exploration missions include: Gravity Effects. Little is known about the adaptation of the human body to a prolonged stay in a low-gravity environment, e.g. on the Moon. Appropriate countermeasures must be developed to control the physical deconditioning effects. Radiation Issues. Enhanced levels of radiation from many sources can threaten crew health, especially during extravehicular activities. In order to provide effective protection, estimates of expected radiation doses and their radio-biological effects must be developed, and countermeasures investigated. Major strategies include: 20 • careful planning of mission duration, timing and operations; • surround crew habitats with sufficient absorbing matter; and • increase initial resistance of exposed personnel against exposure. Psychological Issues. Current countermeasures may be adopted for a lunar mission. However, missions to Mars will involve an unprecedented degree of isolation and confinement. Before human expeditions to Mars become a reality, efficient countermeasures must be developed to cope with the different stress factors. Living and Working Environment. This includes: • the architecture and functioning of the spacecraft and lunar / Martian habitat; • the quantity and quality of consumables (e.g. oxygen, food, potable water); and • the quantity and quality of waste produced. Existing techniques will be used, but substantial mass savings can be achieved by recycling of oxygen, carbon dioxide and water, cleaning of towels and cloths,recycling packaging, on-site food production by bio-regenerative systems and in situ resource utilisation.

### Tests and simulations can further progress space colonization efforts

Finney ‘85

(Ben, Professor at the University of Honolulu in the Department of Anthropology, “Lunar Base, Learning to Live in Space,” <http://articles.adsabs.harvard.edu//full/1985lbsa.conf..751F/0000751.000.html>, 1985, DA: 7/14/11, Madeline)

First, don't separate social science from everything else. As Miller (1984) points out, we are dealing with living systems that are at once biological and social. And, of course, they are technological as well for they will not exist on the Moon without all the hardware and procedures for getting people there, housing them, and keeping them alive. Social scientists must work closely with biologists, human factors specialists, architects, and ultimately, the engineers and managers who conceive, design, and operate the whole system. Second, make the planning of an appropriate lunar social system part of a larger, iterative program for learning how to live in space, whether in orbit, on the surface of the Moon, or on some other body. This program should build upon previous experiences— in space and in analogous situations on Earth. It should focus intensively now on the space station, then apply the lessons from the space station to the lunar base, then learn from the first lunar communities, and so oa Third, conduct realistic simulations of space social systems before they are put into operation. While it may be far too early to start simulating lunar communities, soon we should have enough design information to start space station simulations. Utilizing realistic mock-ups of a space station, experiments could be conducted to investigate various hypotheses on crew composition and structure. For example, do one simulation with a crew organized along hierarchial lines with a commander in complete control, as a captain on a ship, and then do another simulation in which authority is shared according to specified roles and responsibilities. Test various personnel combinations—female/male ratios, proportion of scientists to traditional astronauts, and so forth. Investigate optimum crew size and rotation systems by actually trying them out. From such simulation experiments and from other research and experience, an appropriate space station social organization could be designed, then tested in space and modified according to experience.

# Solvency – Mechanism

## **Space Elevator**

### **Elevator is cost effective**

Edwards 03, (Bradley C. Edwards, Ph.D., Eureka Scientific, The Space Elevator NIAC Phase II Final Report, <http://www.isdc2007.org/resources/library/spaceelevator/2003-SpaceElevator-NIAC-phase2.pdf>)

The most critical element in the development of the space elevator is the design, construction and testing of the carbon nanotube ribbon segments. It is absolutely critical to have ultra-highstrength material (100 GPa) in a form we can use. As we have stated many times, steel is not strong enough, neither is Kevlar, carbon fiber, spider silk or any other material other than carbon nanotubes. Fortunately for us, carbon nanotube research is extremely hot right now and it is progressing quickly to commercial production. A division of Mitsui will be producing about 10 tons of carbon nanotubes each month starting in the next month or two. We have initiated discussions with Mitsui and they will be sending us 100 grams of carbon nanotubes to examine. (We have purchased CNTs for $700/gm. Mitsui will be sending us the 100 grams for free. Their expected sale price is $100/kg!) The quality of these nanotubes is unknown at the moment but based on laboratory production of nanotubes it is expected to be high. Early measurements of carbon nanotubes made in academic labs found them to have tensile strengthes of 63 GPa. Their theoretical tensile strength is 300 GPa. In this program we have purchased roughly 30 grams of carbon nanotubes at a cost of $700/gm. First, all of the carbon nanotube material was characterized in terms of purity (amorphous carbon, Fe, ...), alignment, multi or single-walled and SEM and TEM visualization. It was found that much of the carbon nanotube material that has been available has wildly varying properties depending on who made it and the batch. The TEM and SEM images of our CNT’s from Carbon Nanotechnologies Inc. (CNI) and Cheng in China showed that the Cheng nanotubes produced byThe Space Elevator NIAC Phase II Final Report 8 electric arc discharge were higher quality and better aligned than the ones produced by gas decomposition at CNI. Some residual catalyst (Fe) and some amorphous carbon was found in several of the samples but they can be cleaned by various techniques. Figure 1: SEM and TEM images of some of our carbon nanotubes. The material we purchased was used to develop composite materials to better understand how to make the process work and for health issue testing. The addition of 100 grams from Mitsui and their intention to sell nanotubes at $100/kg will push research in structural applications and allow us to move several efforts forward. One of the current hurdles to carbon nanotube composite development is the high cost of the carbon nanotubes. Mitsui will eliminate this hurdle

### **A2: Can’t power it- laser power**

Edwards 03, (Bradley C. Edwards, Ph.D., Eureka Scientific, The Space Elevator NIAC Phase II Final Report, <http://www.isdc2007.org/resources/library/spaceelevator/2003-SpaceElevator-NIAC-phase2.pdf>)

The best currently designed system for both demonstrating and utilizing the space elevator concept is the laser designed by Lawrence Berkeley National Laboratory and now waiting to be built. It utilizes the sophisticated room temperature accelerator design built for the Stanford Linear Accelerator Complex (SLAC). The SLAC system at Stanford has been operating continuously for over two years now with great success. The laser designed using this technology will operate at 0.84 µm with an initial output power of 200 kW or upgradeable to 1,000 kW (The injector is now being tested at 350kW). It will beam laser power to space using a 15 m diameter beam director. Birds and airplanes can then fly through the laser beam without harm and at focus in space the average beam intensity on the solar panels is ten times that of the sun. Once started, this power beaming complex will require 4-5 years to build.The Space Elevator NIAC Phase II Final Report 11 The laser beam director will have an adaptive optic primary mirror one meter in diameter for focusing and tracking. The lightweight beam director mirrors are expected to be graphite impregnated cyanate ester composites fabricated using the technology now being demonstrated by Bennett Optical Research under a NASA two-year, SBIR Phase II contract. The composite mirrors will be built to the same performance specifications as the Zerodur or ULE mirrors normally used in large telescopes. The coefficient of thermal expansion of the composite is comparable to Zerodur or ULE and Young’s modulus, as measured at Bennett Optical Research on samples furnished by Composite Mirror Applications Inc. of Tucson, AZ, is slightly greater for the composite material than for either of the glasses. Moreover, the composite material is not brittle, and when an adaptive optic mirror is used, the faceplate can be remarkably thin. The mirror influence function 21 which determines how accurately the adaptive optic mirror surface matches the wavefront distortion induced by the atmosphere, can thus match an atmospheric correlation or Fried coefficient 22 only a few centimeters in length. The requirements on “seeing” which have limited observatories to very high locations and keep them from functioning well under turbulent atmospheric conditions are thus greatly relaxed. The composite “transfer mirrors” are made using a replication process, can have scattered light levels comparable to superpolished ULE or Zerodur, excellent optical figures, and cost a fraction of what the more conventional mirrors do. Bennett optical now has a completed facility to begin producing mirrors for this and its other programs.

Elevator is technologically feasible- stabilized by ocean platform

Edwards 03, (Bradley C. Edwards, Ph.D., Eureka Scientific, The Space Elevator NIAC Phase II Final Report, <http://www.isdc2007.org/resources/library/spaceelevator/2003-SpaceElevator-NIAC-phase2.pdf>)

The other issue of the laser power beaming that has been addressed is the stability and size issues of placing this system on an ocean-going platform. The current system requires 150 m of straight path real estate. Our initial baselined platform was 137 m in length though part of this was not usable. Our new anchor design (below and in The Space Elevator) can accommodate this length requirement and has the stability required for supporting the laser and adaptive optics. We have examined the design aspects of the power receiver on the climber and worked out the thermal and electrical efficiency of the design. In conjunction with this we have received specifications and sample GaAs solar cells. Based on the measured specifications for the solar cells we received we can expect 80% light to electricity conversion at 840 nm (Charlie Chu @ Tecstar). We have also examined alternatives such as using amorphous silicon cells to reduce cost and the possibility of doing at least part of the program using direct solar power to reduce the dependence on the laser power beaming. Both of these alternatives have value but we see them as fallback positions.

Construction would be quick

Edwards 03, (Bradley C. Edwards, Ph.D., Eureka Scientific, The Space Elevator NIAC Phase II Final Report, <http://www.isdc2007.org/resources/library/spaceelevator/2003-SpaceElevator-NIAC-phase2.pdf>)

One of the design modifications that was implemented was to increase the drive system preferentially as the climber mass increased. This is possible because specific components such as the power receiver array, structure, and control systems do not increase linearly as the overall size of the climber increases. The mass of these components increase more slowly than linear and the extra mass available can be dedicated to a more powerful drive system. In examining the numbers we found that the drive system could increase by a factor of two and the travel time to the 0.1 g altitude (the point when the next climber could be placed on the ribbon) would drop proportionately. This will reduce the construction time and the overall risk of building the system. We have also considered a number of alternative designs to adding ribbons to the initial ribbon. These have included: 1) leaving the spool on the ground and taking up only the end and then sending up a second climber to attach the second ribbon, 2) grabbing the ribbon in the middle and taking it up then attaching it, 3) leaving the spool on the ground and attaching the ribbon asThe Space Elevator NIAC Phase II Final Report 18 the climber ascends with the ribbon being fed up to the climber, and 4) variations and hybrids of these. What we have found is that there are a number of constraints on the system that limit what can be done. The primary factors that limit the ribbon build-up are: 1) the requirement for the ribbon to have a taper with the narrow end down, and 2) the lifetime of a small ribbon can be hours to days if not attached to the main ribbon. These factors have forced us to remain with our original design.

### **Dodges orbital objects**

Edwards 03, (Bradley C. Edwards, Ph.D., Eureka Scientific, The Space Elevator NIAC Phase II Final Report, <http://www.isdc2007.org/resources/library/spaceelevator/2003-SpaceElevator-NIAC-phase2.pdf>)

Orbital objects have always been a concern. We calculated that a large orbital object, satellite or debris, would strike the space elevator at least once a year if nothing were done to prevent it. This problem is currently of concern because our legal study has stated that we will not be allowed to construct the space elevator unless we can demonstrate that it will not get in the way of existing, operational satellites. In addition, the recent cancellation of the ProSEDS mission five weeks prior to launch because the possibility that it might strike the ISS demonstrates the reality of the concern.The Space Elevator NIAC Phase II Final Report 23 We have gone through a complete calculation on the likelihood of an orbital collision and found tracking systems that can warn us of an impact days to week ahead of time and a system for moving the ribbon to avoid the collision. The tracking system would consist of various radar and optical detector systems such as have been proposed and implemented for different applications. The design of the Allen Array, a phased array radar system using many small dishes, is one possible design that we are considering. The optical detectors proposed by Ho (LANL) is another system for completing the detection of small objects. Viking Scientific who works with JSC on orbital debris has offered to help with this work and attended our conference

Vehicle

### Space elevator is safer than other space transportation

Edwards 06 (Bradley, Director of Research-Institute for Scientific Research, worked at Los Alamos researching advanced space technologies for 11 years, with Phillip Ragan, Leaving the Planet by Space Elevator, p.161-162)

The space elevator is even more uplifting than it seems. Spacefarers no longer need to fear the dramatic forces and vibrations normally experienced with a rocket launch. This vehicle can adjust its speed to accommodate passengers. Likewise, cargo and astronauts eliminate the crushing forces of re entry used by rockets for slowing down when coming back to Earth. "You can travel as slow as 10 miles per hour, making it [re entry] much safer," Edwards said. In contrast to rockets where most of what's being launched is fuel, the space elevator moves only the payload, a set of motors, and structures needed for its operation.

### Space elevator is key to space dominance— Japanese Space Jam

Colony Worlds, 09 (Colony Worlds is a group of people who seek to highlight the innovation in technology, medicine and science that will help our species discover new homes upon new worlds, Awesome: Japan May Commit $10 Billion Towards Space Elevator, http://www.colonyworlds.com/2008/10/awesome-japan-may-commit-10-billion-towards-space-elevator.html, JG)

With both the US and China relying upon rockets to secure their solar future beyond the heavens, it looks as if the nation of the rising sun is placing its bets on the space elevator. (RIA Novosti) Japanese engineers intend to build an elevator to deliver cargo into space. Japanese authorities are prepared to allocate $10 billion for the project. The space elevator is expected to cut the cost of delivering cargo into space and is considered one of the most ambitious projects of the 21st century. The Japanese plan to unveil a schedule for the elevator’s assembly and commissioning this November. While the space elevator has its share of engineering problems, its successful construction would pretty much guarentee Japan’s space dominance over its rivals, as Japan would be able to launch cargo at much lower prices than either China or the US could via rockets. A space elevator would enable Japan to establish large colonies fairly quickly on both the Moon and Mars–not to mention help the nation generate billions of Yen by renting it out to half the planet.

### A2: Terrorist attacks- Out of reach

Edwards 07 (Bradley, Director of Research-Institute for Scientific Research, worked at Los Alamos researching advanced space technologies for 11 years, Space Elevator: Expert Q&A, Jan 16, http://www.pbs.org/wgbh/nova/space/edwards-elevator.html)

How can your space elevator possibly be protected from sabotage or terrorist attacks? Talk about a tempting target! Bill Pitts, Mississippi Edwards: Nothing can be completely protected, although the elevator is out in the middle of the ocean and far away from everything. It is a challenge to get to and difficult to "sneak up" on. The other issue is that an attack on the elevator would cause a financial impact to a company, but minimal loss of life in the scenario in which we plan to use it. Everything, including the elevator, is, of course, a potential terrorist target, but we suspect we may be lower on the list.

### Space elevator’s cable resists temperature changes

Edwards 07 (Bradley, Director of Research-Institute for Scientific Research, worked at Los Alamos researching advanced space technologies for 11 years, Space Elevator: Expert Q&A, Jan 16, http://www.pbs.org/wgbh/nova/space/edwards-elevator.html)

Q: Would the elevator burn up on its way down or freeze on its way up? How would the cable resist the temperature changes? Lars, Eleva, Wisconsin Edwards: Actually, the temperature doesn't change that much as you ascend the elevator. Temperature changes are more related to going in and out of the Earth's shadow (day and night). In space, it is also the case that the sun warms one side and space cools the opposite side of any container. Good insulation and thermal conduction are required.

A2: Severe weather- Location and oscillation solve

Edwards 07 (Bradley, Director of Research-Institute for Scientific Research, worked at Los Alamos researching advanced space technologies for 11 years, Space Elevator: Expert Q&A, Jan 16, http://www.pbs.org/wgbh/nova/space/edwards-elevator.html)

Q: I think the space elevator is a terrific idea, and I understand how it works, but how would you maintain stability above, say, 1,000 feet? Couldn't one severe storm start the apparatus twisting and swaying, bringing the structure down? Jim Suss, Marietta, Georgia Edwards: Due to the dynamics, the elevator is held extremely tight and will be fairly rigid. Storms and winds will blow it around and move it. We will need to deal with twisting and oscillations, but one thing to remember is that the frequency of this system is seven hours, a very slow oscillation. The other aspect is that the anchor will be located in the eastern equatorial Pacific Ocean at a place devoid of major storms, wind, or lightning, just north of the doldrums.

### A2: Aviation disruption- Location

Edwards 07 (Bradley, Director of Research-Institute for Scientific Research, worked at Los Alamos researching advanced space technologies for 11 years, Space Elevator: Expert Q&A, Jan 16, http://www.pbs.org/wgbh/nova/space/edwards-elevator.html)

Q: What are the dangers to aviation with regard to the cable? Anonymous Edwards: We will need to have airplanes stay clear of the ribbon. This shouldn't be a problem since the anchor is located hundreds of miles from any air routes.

### Space elevator is key to the future of space development

Edwards 07 (Bradley, Director of Research-Institute for Scientific Research, worked at Los Alamos researching advanced space technologies for 11 years, Space Elevator: Expert Q&A, Jan 16, http://spectrum.ieee.org/aerospace/space-flight/a-hoist-to-the-heavens)

It sounds like a crazy idea, and indeed the space elevator has been the stuff of science fiction for decades. But if we want to set the stage for the large-scale and sustained exploration and colonization of the planets and begin to exploit solar power in a way that could significantly brighten the world's dimming energy outlook, the space elevator is the only technology that can deliver. It all boils down to dollars and cents, of course. It now costs about US $20 000 per kilogram to put objects into orbit. Contrast that rate with the results of a study I recently performed for NASA, which concluded that a single space elevator could reduce the cost of orbiting payloads to a remarkably low $200 a kilogram and that multiple elevators could ultimately push costs down below $10 a kilogram. With space elevators we could eventually make putting people and cargo into space as cheap, kilogram for kilogram, as airlifting them across the Pacific. The implications of such a dramatic reduction in the cost of getting to Earth orbit are startling. It's a good bet that new industries would blossom as the resources of the solar system became accessible as never before. Take solar power: the idea of building giant collectors in orbit to soak up some of the sun's vast power and beam it back to Earth via microwaves has been around for decades. But the huge size of the collectors has made the idea economically unfeasible with launch technologies based on chemical rockets. With a space elevator's much cheaper launch costs, however, the economics of space-based solar power start looking good. A host of other long-standing space dreams would also become affordable, from asteroid mining to tourism. Some of these would depend on other space-transportation technologies for hauling people and cargo past the elevator's last stop in high-Earth orbit. But physics dictates that the bulk of the cost is dominated by the price of getting into orbit in the first place. For example, 95 percent of the mass of each mighty Saturn V moon rocket was used up just getting into low-Earth orbit. As science-fiction author Robert A. Heinlein reportedly said: "Once you get to Earth orbit, you're halfway to anywhere in the solar system." With the huge cost penalty of traveling between Earth and orbit drastically reduced, it would actually be possible to quarry mineral-rich asteroids and return the materials to Earth for less than what it now costs, in some cases, to rip metal ores out of Earth's crust and then refine them. Tourism, too, could finally arrive on the high frontier: a zero-gravity vacation in geostationary orbit, with the globe spread out in a ceaselessly changing panoply below, could finally become something that an average person could experience. And for the more adventurous, the moon and Mars could become the next frontier.

### Space elevator is the most efficient and cheap form of space transportation

Edwards 07 (Bradley, Director of Research-Institute for Scientific Research, worked at Los Alamos researching advanced space technologies for 11 years, Space Elevator: Expert Q&A, Jan 16, http://spectrum.ieee.org/aerospace/space-flight/a-hoist-to-the-heavens)

So why can't we do all this with rockets? And why is the space elevator so cheap? The answer is that chemical rockets are inherently too inefficient: only a tiny percentage of the mass at liftoff is valuable payload. Most of the rest is fuel and engines that are either thrown away or recycled at enormous expense. Nuclear and electric rockets promise huge improvements in efficiency and will be vital to the future of solar system exploration, but they are impractical as a means of getting off Earth: they either don't produce enough thrust to overcome gravity or pose a potentially serious radiation hazard. On the other hand, space elevators could haul tons of material into space all day, every day. And the core of the space elevator--the cable--could be constructed from cheap, plentiful materials that would last for decades. A space elevator would be amazingly expensive or absurdly cheap--depending on how you look at it. It would cost about $6 billion in today's dollars just to complete the structure itself, according to my study. Costs associated with legal, regulatory, and political aspects could easily add another $4 billion, but these expenses are much harder to estimate.

## Water Power Space Ship

### **Water powered space coach economically rewarding**

Space.com 03/26/11, (Mike Wall, SPACE.com Senior Writer, Water-Powered Spaceship Could Make Mars Trip on the Cheap, http://www.space.com/11230-water-powered-spaceship-mars-solar-system.html)

Spaceships powered primarily by water could open up the solar system to exploration, making flights to Mars and other far-flung locales far cheaper, a recent study has found. A journey to Mars and back in a water-fueled vehicle could cost as little as one space shuttle launch costs today, researchers said. And the idea is to keep these "space coaches" in orbit between trips, so their relative value would grow over time, as the vehicles reduce the need for expensive one-off missions that launch from Earth. The water-powered space coach is just a concept at the moment, but it could become a reality soon enough, researchers said. [Video: Space Engines: The New Generation] "It's really a systems integration challenge," said study lead author Brian McConnell, a software engineer and technology entrepreneur. "The fundamental technology is already there."

Most effective form of transportation

Space.com 03/26/11, (Mike Wall, SPACE.com Senior Writer, Water-Powered Spaceship Could Make Mars Trip on the Cheap, http://www.space.com/11230-water-powered-spaceship-mars-solar-system.html)

The space coach concept vehicle is water-driven and water-centric, starting with its solar-powered electrothermal engines. These engines would super-heat water, and the resulting steam would then be vented out of a nozzle, producing the necessary amount of thrust. Electrothermal engines are very efficient, and they're well-suited for sustained, low-thrust travel, researchers said. This mode of propulsion would do the lion's share of the work, pushing the space coach from Earth orbit to Mars. Smaller chemical rockets could be called into service from time to time when a rapid change in velocity is needed, McConnell said. The space coach's living quarters would be composed of a series of interconnected habitat modules. These would be expandable and made of fabric, researchers said — much like Bigelow Aerospace's inflatable modules, which have already been deployed and tested in low-Earth orbit. Water would be a big part of the space coach's body, too, according to the study. Packed along the habitat modules, it would provide good radiation shielding. It could also be incorporated into the fabric walls themselves, freezing into a strong, rigid debris shield when the structure is exposed to the extreme cold of space. Rotating the craft could also generate artificial gravity approximating that of Earth in certain parts of the ship, researchers said.

### Space coach’s economic sufficiency means more space travel

Space.com 03/26/11, (Mike Wall, SPACE.com Senior Writer, Water-Powered Spaceship Could Make Mars Trip on the Cheap, http://www.space.com/11230-water-powered-spaceship-mars-solar-system.html)

The dependence on water as the chief propellant would make the space coach a relatively cheap vehicle to operate, researchers said. That's partly because electrothermal engines are so efficient, and partly because the use of water as fuel makes most of the ship consumable, or recyclable. Because there are fewer single-use materials, there's much less dead weight. Water first used for radiation shielding, for example, could later be shunted off to the engines. Combined, these factors would translate into huge savings over a more "traditional" spacecraft mission to Mars using chemical rockets, according to the study. "Altogether, this reduces costs by a factor of 30 times or better," McConnell told SPACE.com. He estimates a roundtrip mission to the Martian moon Phobos, for example, could be made for less than $1 billion.

### Game changer for space travel

Space.com 03/26/11, (Mike Wall, SPACE.com Senior Writer, Water-Powered Spaceship Could Make Mars Trip on the Cheap, http://www.space.com/11230-water-powered-spaceship-mars-solar-system.html)

McConnell envisions space coaches cruising around the solar system, each individual vehicle fueling up with water in low-Earth orbit when the need arises. In the future, fuel could be sourced along a space coach's travels — for example, water could be mined from an asteroid or a Martian moon. Parts could be swapped out and upgraded on orbit as well, helping to keep the space coaches in good operating condition for several decades, McConnell said. Each mission undertaken from low-Earth orbit would be far cheaper than anything launching from the ground. McConnell thinks an entire fleet of space coaches could one day populate the heavens, flying a variety of different flags — as long as somebody takes the initial plunge. "If one party decides to do this, I think it would spur a lot of other activity," McConnell said. "I think countries wouldn't want to get left behind."

## Space Cars

### Luxurious space cars

O’Neil 74’ (Gerard K. O'Neill, professor of physics at Princeton University, September, 1974, Physics Today, http://mike-combs.com/space/TCoS.html)

Travel between communities can also be carried out with simple engineless vehicles, accelerated in a computed direction by a stationary cable-pulling electric motor and decelerated by an arresting cable at the destination. The "cable-car" vehicles for such free flight need no fuel, no complex maintenance nor a highly trained crew, and should be inexpensive. Vehicle speeds permit travel among a total population larger than that of Earth within flight times of seven hours. (I have here assumed communities spaced at 200-km intervals, so that the maximum dimension of a planar cluster housing 4 billion people is 29,000 km. For a vehicle with acceleration 1g and the required travel time of seven hours, the acceleration length is 66 km.) With no need for aerodynamic design, the vehicles can be far more roomy and comfortable than the typical earthbound commercial jet.

### Environmentally and cost efficient space RVs (National Lampoon’s Space Vacation)

O’Neil 74’ (Gerard K. O'Neill, professor of physics at Princeton University, September, 1974, Physics Today, http://mike-combs.com/space/TCoS.html)

With an abundance of food and clean electrical energy, controlled climates and temperate weather, living conditions in the colonies should be much more pleasant than in most places on Earth. For the 20-mile distances of the cylinder interiors, bicycles and lowspeed electric vehicles are adequate. Fuel-burning cars, powered aircraft and combustion heating are not needed; therefore, no smog. For external travel, the simplicity of engineless, pilotless vehicles probably means that individuals and families will be easily able to afford private space vehicles for low-cost travel to far distant communities with diverse cultures and languages. The "recreational vehicles" of the colonial age are therefore likely to be simple spacecraft, consisting of well furnished pressure shells with little complexity beyond an oxygen supply and with much the same arrangement of kitchen facilities and living space as are found today in our travelling homes.

### Cost efficient space buckets

O’Neil 74’ (Gerard K. O'Neill, professor of physics at Princeton University, September, 1974, Physics Today, http://mike-combs.com/space/TCoS.html)

The alternative method, called "TLA" for transport linear accelerator, uses the technology of dynamic magnetic levitation and the linear synchronous motor. The TLA is a recirculating system of small, passive vehicles (buckets), each having no moving parts but containing superconducting. coils. The bucket accelerates a 9-kg payload to escape speed along a magnetic-levitation, linear-synchronous track. Deceleration then releases the payload, the bucket slows to a moderate speed, and is recirculated to receive another payload. Table 3 shows some guideline pararneters. The mass estimate is 1500 tons, Of which about 80% is in power-generation and power-handling equipment. In six years, running 25% of the time, the TLA can transport over 300 times its own weight. (For a short bibliography of early work on the possibilities of electromagnetic launching, before the development of dynamic magnetic levitation see reference 13.)

# Solvency – Location

## Solvency—Moon-- Leadership

### Colonization of the moon is possible: Vital for American Leadership

Schmitt et al 9 – Harrison H. Schmitt, geologist, Apollo 17 astronaut, Former Chair NASA Advisory Council, Andy Daga, Lunar surface architecture and technology consultant, and Jeff Plescia, Applied Physics Laboratory, The Johns Hopkins University, 2009, “Geopolitical Context of Lunar Exploration and Settlement,” online: http://www.lpi.usra.edu/decadal/leag/DecadalGeopolitical.pdf

The competitive international venue remains at the Moon. Returning there now meets the requirements for a U.S. space policy that maintains deep space leadership, as well as providing major new scientific returns and opportunities. Without a lunar focus, the nation’s human space activity will consist of PowerPoint presentations about what might be done and not about what will be done. Properly conceived and implemented, however, returning to the Moon prepares the way for a new generation to go to Mars.

The current Constellation Program contains most of the technical elements necessary to implement a policy of deep space leadership, particularly development of a heavy-lift launch vehicle, the Ares V. In addition, Constellation includes a large upper stage for transfer to the Moon and other destinations, two well-conceived spacecraft for transport and landing of crews on the lunar surface (Orion and Altair), strong concepts for exploration and lunar surface systems, and enthusiastic engineers and managers to make it happen if adequately supported. The one major missing component of a coherent and sustaining architecture may be a well- developed concept for in-space refueling of spacecraft and upper rocket stages. On the other hand, the experience base for developing in-space refueling capabilities clearly exists based on a variety of past activities, including ISS construction.

If we continue to abandon leadership in deep space to other nations or group of nations, particularly a non-democratic regime, the ability for the United States and its allies to protect themselves and liberty for the world will be at great risk and potentially impossible. To others would accrue the benefits — psychological, political, technical, economic and scientific — that the United States harvested as a consequence of Apollo’s success 40 years ago. This lesson has not been lost on our ideological and economic competitors. American leadership absent from space? Is this the future we wish for our progeny?

## Solvency—Moon—Springboard

### Colonization of the moon is vital to the colonization of Mars

Schmitt et al 9 – Harrison H. Schmitt, geologist, Apollo 17 astronaut, Former Chair NASA Advisory Council, Andy Daga, Lunar surface architecture and technology consultant, and Jeff Plescia, Applied Physics Laboratory, The Johns Hopkins University, 2009, “Geopolitical Context of Lunar Exploration and Settlement,” online: http://www.lpi.usra.edu/decadal/leag/DecadalGeopolitical.pdf

What, then, should be the focus of national space policy in order to maintain leadership in deep space? Some propose that we concentrate only on Mars. This would be naïve and self-defeating. The country is simply not technically ready to go to Mars at present, and it will be a long time until we are ready to do so. Returning to the Moon, however, provides the fastest path for humans to go to Mars. Without the experience of returning to the Moon, we will not have the engineering or physiological insight for many decades to either fly to Mars or land there. Without lunar water resources, radiation protection for the long voyage to Mars may not be possible. Without the development of lunar helium-3 fusion technology applied to interplanetary propulsion, we may not be able to reduce the transit time to Mars to an acceptable duration. Without lunar operational experience, including learning to operate outside of communications with Earth, we vastly increase the risk of early Martian flights. Without lunar oxygen and water, Earth launch payloads to Mars may be prohibitively large and expensive, not to mention the continued uncertainties about sustainable resources on Mars. Without lunar rocket fuel resources, that is, hydrogen, oxygen and/or methane, we may not be able to land on Mars because of complicating presence of just some atmosphere and not a lot. Indeed, without returning to the Moon, future opportunities of leadership, including a much greater potential for international cooperation in scientific endeavors related to the Moon and beyond, cannot be realized

## Solvency—Moon—Laundry List

### Colonizing the moon is good: Laundry List

### **Murphy, June 14th, 2008** (25, Good Reasons to Go to the Moon, Ken Murphy, member of the Board of Directors of the National Space Society http://www.outofthecradle.net/archives/2008/06/25-good-reasons-to-go-to-the-moon-2/)

1) Hydrogen Whether in water form or not, we do know that there is hydrogen at the Lunar poles. This can serve a minumum of two ends: water for a base, fuel for rockets.2) Oxygen The heavy part of the LH/LOX fuel mix is the oxygen, about 7/8ths of the weight. Instead of launching all the fuel for cislunar maneuvering from Earth, launch 8x the hydrogen from Earth and mix it with the Lunox. 3) 1/6th gravity This will provide engineering fun and challenges for future generations of engineers. How does one design an extensible tower for a solar mirror with 1/6th the force of gravity? 4) No weather This goes hand-in-hand with #3. Engineering design will be significantly different in a vacuum environment with no water, wind, rain, hurricanes, or tornadoes. Corrosion takes a different form. 5) Vacuum A critical part of many of the engineering processes used here on Earth, requiring the expenditure of large amounts of energy to create a vacuum. The Moon has about 15,000,000 square miles of it. 6) Glass A good proportion of the Lunar soil returned by astronauts was in the form of glass. Lunar glass has the distinct characteristic of having formed in a water-free environment, making it anhydrous. What advantages this may offer in the field of optics is largely Luna Incognito. Then there’s fiberglass, composites, etc. 7) Human factors Having 1/6th of Earth’s gravity, the heart doesn’t have to pump as hard to supply oxygen to the brain. While for a youth this would have an atrophy-type effect, for those advanced in years it can serve a rejuvenative effect, as the heart is suddenly relatively stronger. This allows for longer productive lives for our citizens. And you can fly in a large enough space. 8 ) Crater history The Moon is the best record in our local neighborhood of the history of bombardments from space. Earth is too dynamic to sustain a record, but the Moon is perfect. By establishing an impact history in size and time we can look for any cyclicality in the timing of impacts, and if so, where are we in the cycle? Addendum: Dr. Paul Spudis has pointed out that the Moon also provides a historical record of the Solar System’s journey around the galactic core as well. 9) Cold-traps At the Lunar poles, there are places the sun never shines. These everdark craters seem to hold the bulk of the hydrogen detected at the poles. Excavations outside the craters can create additional cold-traps for later industrial use.

10) Solar mirrors Mounted on extensible towers, mirrors can be placed in perpetual sunlight to illuminate selected areas. This requires the high-technology capability to turn the mirror. No batteries required. 11) Solar power towers Extensible towers at the poles will allow the placement of solar cells or films in constant sunlight. It doesn’t matter so much hitting the perfect peak for one’s ground-based system as making the tower high enough to peek over the horizon, which on the Moon is very short. 12) Radio silence While not a perfectly radio-silent environment, the far side of the Moon is far better than anything on Earth or even in orbit. Large arrays can allow for a leap in precision for radio astronomy and SETI. 13) Solar cathedral A number of religions and cultures around the world still use the Lunar calendar in the conduct of their affairs. Part of this involves determining the beginning of each lunar month. Building a Solar cathedral on the Moon will allow an unprecedented degree of precision in making that determination. It’s also a good way of getting different faiths to work together. 14) Neighborhood watch The orbital scopes like Hubble get all of the credit for cool deep-space discoveries, but no one’s keeping an eye on our local neighborhood. That’s why we’re finding more and more asteroids after they’ve passed the Earth. The Moon provides the kind of dull, stable platform for the astronomy that no one else wants to do. 15) Greenhouses Lunar regolith can’t really grow plants by itself, but the addition of humus (not hummus), other nutrients, and careful recycling does allow for plant growth. Plants grown in Lunar soil may provide new fragrances, flavors, and vintages. Spices were one of the early high-value, low mass/volume goods that helped create the trade routes of old. 16) Metals Vacuum-processed ultra-pure aluminum. Vacuum-processed ultra-pure titanium. Vacuum-processed ultra-pure iron. Vacuum-processed ultra-pure magnesium. You want it? We’ve got it. 17) Volatiles The Sun has been burying light elements in the Lunar soil for aeons. All it takes is a little baking at about 1100 K, a little shaking to agitate the particles, and a place to liquefy the output. Cold-traps are particularly useful for this. 18) Extreme sports Imagine bicycle races at 250 kph. Imagine regoboarding the southside of Copernicus. Imagine flying in a large underground cavern. Imagine high-jumping in 1/6th G. Or long-jumping. 19) Spaceships Some items, like advanced electronics, will be shipped from Earth for a very long time. But things like spacecraft structural elements (and fuel) can easily be done on the Moon, obviating the need to waste the lift mass from Earth’s gravity well. 20) EML-1 Having such a large neighbor so close by creates a warp in Earth’s gravity well. There are certain areas of relative stability, and one lies on the line connecting the center of the Earth and Moon. Putting a station at that point (or rather in a halo orbit around it) allows for all kinds of unexpected benefits. 21) GEO assets We have billions of dollars of orbital assets in geosynchronous orbit. It’s cheaper in fuel to go from EML-1 to GEO and back, than to go just from LEO to GEO. Over time, this will allow for a huge decrease in the cost of refueling, repairing, and upgrading, as well as building larger and more capable platforms. 22) Solar power satellites Placement of large solar arrays in GEO orbit allows for the collection and transmission of energy to fixed points on Earth, such as military bases. This will also provide a long-term source of energy, as the Sun is not expected to expire for another 4.5 billion years or so. Besides, most of the energy we use here on Earth is second or third-hand solar power anyway. Pieces of the solar power satellites, like PV cells and structural elements, can come from the

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Moon. 23) Free-flyer platforms Another consequence of the warping of Earth’s gravity well is that trajectories can be created that sort of wander out from EML-1, and then wander back (like the Genesis mission which went via EML-1 to SEL-1 and back). This affords materials scientists and companies the opportunity to send free-flyer platforms on long-term, jitter-free production runs. Results can be studied on the station and new production runs undertaken quickly. 24) Constant access The entire Lunar surface is accessible 24-hours a day from EML-1 for about the same delta-V (~2.5km/s). From EML-1 most inclinations of LEO are accessible for less than 1.0 km/s (with aerobraking and time, ~3.77km/s for a direct burn). GEO is constantly accessible, as is deep space. 25) A true space-faring civilization The Moon is the ideal location to get our feet wet, and getting there can lay the foundation for a civilization that can go beyond the Moon to Mars and the asteroids and other destinations of interest.

## Solvency—Moon—A2: Where?

### **Lava tubes are a fantastic location for colonies**

CNN Tech 10 (Moon hole might be suitable for colony: http://articles.cnn.com/2010-01-01/tech/moon.lava.hole\_1\_lunar-base-lava-flows-lunar-surface?\_s=PM:TECH)

Building a home near a moon crater or a lunar sea may sound nice, but moon colonists might have a much better chance of survival if they just lived in a hole. That's the message sent by an international team of scientists who say they've discovered a protected lunar "lava tube" -- a deep, giant hole -- that might be well suited for a moon colony or a lunar base. The vertical hole, in the volcanic Marius Hills region on the moon's near side, is 213 feet wide and is estimated to be more than 260 feet deep, according to findings published in Geophysical Research Letters, a journal of the American Geophysical Union.

More important, the scientists say, the hole is protected from the moon's harsh temperatures and meteorite strikes by a thin sheet of lava. That makes the tube a good candidate for further exploration or possible inhabitation, the article says. "Lunar lava tubes are a potentially important location for a future lunar base, whether for local exploration and development, or as an outpost to serve exploration beyond the Moon," writes the team, led by Junichi Haruyama, a senior researcher with the Japanese space agency JAXA. "Any intact lava tube could serve as a shelter from the severe environment of the lunar surface, with its meteorite impacts, high-energy UV radiation and energetic particles, and extreme diurnal temperature variations. Lava tubes have previously been discovered on the moon, but the scientists say the new hole is notable because of its lava shield and because it does not appear to be prone to collapse. Lave tubes exist on Earth and also have been found on Mars. The cylinder-shaped caverns can be carved out by lava flows, volcanic eruptions, seismic activity or ground collapse resulting from meteoroid strikes. The scientists used high-resolution images from a Japanese moon orbiter called SELENE to discover this lunar lava tube. The findings were published November 12, but they grabbed the attention of the public this week. NASA is reportedly working on plans to return to the moon by 2020 and to set up a temporary lunar colony by 2025 as part of the Constellation Program. Funding for the program, however, remains somewhat in question. The American space agency could not be reached for comment.

## Solvency- A2 No Water

### The Moon has as much water as Earth

Newitz 5-26-2011(Annalee, Editor for IO9.com: The Moon may have the same proportion of water as Earth does: http://io9.com/5805307/the-moon-may-have-as-much-water-as-earth-does)

Today**, a group of scientists announced that beneath the surface of the Moon there may be as much water as we have on Earth. This revelation could change everything we know about the Moon — and pave the way for lunar colonies in the next twenty years**. The researchers used a special ion probe to analyze samples of volcanic glass dug up from the Moon's surface by the crew of Apollo 17. Water and other volatiles from deep beneath the Moon's surface remain preserved in this glass, and allowed the team of scientists to determine likely water levels in the Moon's mantle. Those levels were 100 times higher than what previous studies found. If this study holds up, **Moon only has as much water as Earth does in a proportional sense -** not as much total water, but as much water as the Earth would have in its mantle if it were the same size as the Moon. In a statement, Case Western Reserve University geologist James Van Orman said: In contrast to most volcanic deposits, the melt inclusions are encased in crystals that prevent the escape of water and other volatiles during eruption. These samples provide the best window we have to the amount of water in the interior of the Moon. Added Brown professor Alberto Saal, another geologist who worked on the study The bottom line is that in 2008, we said the primitive water content in the lunar magmas should be similar to the water content in lavas coming from the Earth's depleted upper mantle. Now, we have proven that is indeed the case. Writing in Science, the team asserted: These volatile contents are very similar to primitive terrestrial mid-ocean ridge basalts and indicate that some parts of the lunar interior contain as much water as Earth's upper mantle. In other words, we're seeing — at least in this chunk of volcanic glass — something that looks very similar to what we'd expect on Earth. This could change our understanding of how the Moon was formed. Generally it's believed that the Moon broke off from Earth when our planet was hit by a Mars-sized body. But an impact like that wouldn't have left much water behind. Is it possible the Moon was formed in some other way? That's a subject for further research, but the research team notes two possibilities: one, at some point Earth and the Moon may have shared the same "atmospheric envelope;" or two, the sample that the team analyzed might be aberrant and not indicative of a watery mantle all over the Moon. These findings also shed light on the icy deposits that probes recently found deep in the shadows of Moon craters. Until now, scientists mostly believed that water came from icy meteors smashing into Luna and leaving water behind. Now it seems that this water probably originated on the Moon, and was brought to the surface by magma in volcanic eruptions. So how will all of this affect our plans for a lunar colony? Obviously, if the mantle is as water-rich as this new research suggests, we'll have a better chance of generating water and oxygen on the Moon for our habitats. Plus, If lunar water is associated with volcanic activity, then that makes **NASA's idea to build a lunar colony in one of the Moon's giant magma holes even more attractive**.

### Water is available on the Moon

CNN Tech 09(NASA finds 'significant' water on moon, November 13th, http://articles.cnn.com/2009-11-13/tech/water.moon.nasa\_1\_lunar-crater-observation-anthony-colaprete-solar-system?\_s=PM:TECH)

NASA said Friday it had discovered water on the moon, opening "a new chapter" that could allow for the development of a lunar space station. The discovery was announced by project scientist Anthony Colaprete at a midday news conference. "I'm here today to tell you that indeed, yes, we found water. And we didn't find just a little bit; we found a significant amount" -- about a dozen, two-gallon bucketful’s, he said, holding up several white plastic containers. The find is based on preliminary data collected when the Lunar Crater Observation and Sensing Satellite, or LCROSS, intentionally crashed October 9 into the permanently shadowed region of Cabeus crater near the moon's south pole.

### There is water on the moon and can be utilized for drinking and fuel in the future

Thomson 09(Andrea September 23, Senior Writer for Space.com, It’s Official, Water found on the moon: http://www.space.com/7328-official-water-moon.html)

The new findings, detailed in the Sept. 25 issue of the journal Science, come in the wake of further evidence of lunar polar water ice by NASA's Lunar Reconnaissance Orbiter and just weeks before the planned lunar impact of NASA's LCROSS satellite, which will hit one of the permanently shadowed craters at the moon's south pole in hope of churning up evidence of water ice deposits in the debris field. The moon remains drier than any desert on Earth, but the water is said to exist on the moon in very small quantities. One ton of the top layer of the lunar surface would hold about 32 ounces of water, researchers said. ? "If the water molecules are as mobile as we think they are ? even a fraction of them ? they provide a mechanism for getting water to those permanently shadowed craters," said planetary geologist Carle Pieters of Brown University in Rhode Island, who led one of the three studies in Science on the lunar find, in a statement. "This opens a whole new avenue [of lunar research], but we have to understand the physics of it to utilize it." Finding water on the moon would be a boon to possible future lunar bases, acting as a potential source of drinking water and fuel. Apollo turns up dry. When Apollo astronauts returned from the moon 40 years ago, they brought back several samples of lunar rocks. The moon rocks were analyzed for signs of water bound to minerals present in the rocks; while trace amounts of water were detected, these were assumed to be contamination from Earth, because the containers the rocks came back in had leaked. "The isotopes of oxygen that exist on the moon are the same as those that exist on Earth, so it was difficult if not impossible to tell the difference between water from the moon and water from Earth," said Larry Taylor of the University of Tennessee, Knoxville, who is a member of one of the NASA-built instrument teams for India's Chandrayaan-1 satellite and has studied the moon since the Apollo missions. While scientists continued to suspect that water ice deposits could be found in the coldest spots of south pole craters that never saw sunlight, the consensus became that the rest of the moon was bone dry. But new observations of the lunar surface made with Chandrayaan-1, NASA's Cassini spacecraft, and NASA's Deep Impact probe, are calling that consensus into question, with multiple detections of the spectral signal of either water or the hydroxyl group (an oxygen and hydrogen chemically bonded). Three spacecraft Chandrayaan-1, India's first-ever moon probe, was aimed at mapping the lunar surface and determining its mineral composition (the orbiter's mission ended 14 months prematurely in August after an abrupt malfunction). While the probe was still active, its NASA-built Moon Mineralogy Mapper (M3) detected wavelengths of light reflected off the surface that indicated the chemical bond between hydrogen and oxygen ? the telltale sign of either water or hydroxyl. Because M3 can only penetrate the top few millimeters of lunar regolith, the newly observed water seems to be at or near the lunar surface. M3's observations also showed that the water signal got stronger toward the polar regions. Pieters is the lead investigator for the M3 instrument on Chandrayaan-1. Cassini, which passed by the moon in 1999 on its way to Saturn, provides confirmation of this signal with its own slightly stronger detection of the water/hydroxyl signal. The water would have to be absorbed or trapped in the glass and minerals at the lunar surface, wrote Roger Clark of the U.S. Geological Survey in the study detailing Cassini's findings. The Cassini data shows a global distribution of the water signal, though it also appears stronger near the poles (and low in the lunar maria). Finally, the Deep Impact spacecraft, as part of its extended EPOXI mission and at the request of the M3 team, made infrared detections of water and hydroxyl as part of a calibration exercise during several close approaches of the Earth-Moon system en route to its planned flyby of comet 103P/Hartley 2 in November 2010. Deep Impact detected the signal at all latitudes above 10 degrees N, though once again, the poles showed the strongest signals. With its multiple passes, Deep Impact was able to observe the same regions at different times of the lunar day. At noon, when the sun's rays were strongest, the water feature was lowest, while in the morning, the feature was stronger. "The Deep Impact observations of the Moon not only unequivocally confirm the presence of [water/hydroxyl] on the lunar surface, but also reveal that the entire lunar surface is hydrated during at least some portion of the lunar day," the authors wrote in their study. The findings of all three spacecraft "provide unambiguous evidence for the presence of hydroxyl or water," said Paul Lucey of the University of Hawaii in an opinion essay accompanying the three studies. Lucey was not involved in any of the missions. The new data "prompt a critical reexamination of the notion that the moon is dry. It is not," Lucey wrote. Where the water comes from Combined, the findings show that not only is the moon hydrated, the process that makes it so is a dynamic one that is driven by the daily changes in solar radiation hitting any given spot on the surface. The sun might also have something to do with how the water got there. There are potentially two types of water on the moon: that brought from outside sources, such as water-bearing comets striking the surface, or that that originates on the moon. This second, endogenic, source is thought to possibly come from the interaction of the solar wind with moon rocks and soils. The rocks and regolith that make up the lunar surface are about 45 percent oxygen (combined with other elements as mostly silicate minerals). The solar wind ? the constant stream of charged particles emitted by the sun ? are mostly protons, or positively charged hydrogen atoms. If the charged hydrogens, which are traveling at one-third the speed of light, hit the lunar surface with enough force, they break apart oxygen bonds in soil materials, T

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Taylor, the M3 team member suspects. Where free oxygen and hydrogen exist, there is a high chance that trace amounts of water will form. The various study researchers also suggest that the daily dehydration and rehydration of the trace water across the surface could lead to the migration of hydroxyl and hydrogen towards the poles where it can accumulate in the cold traps of the permanently shadowed regions.

## Solvency- Springboard to Mars

### Colonizing the Moon makes way for Mars

Dinkin 04(Sam September 7th, Writer for the Space Review: Colonize the Moon before Mars- http://www.thespacereview.com/article/221/1)

The Moon may become a very exciting destination with a substantial GDP. Being there first means that the high ground is already occupied for any future militarization of the Moon. It’s possible that colonizing the Moon will help muster the political will to colonize Mars. Earthers will be able to see the colony directly with their own eyes. A convincing existence proof will be there for everyone to see that colonization is feasible and profitable. A lunar colony is a politically feasible off-Earth gene bank increasing the chances that the species will be immortal. The act of leaving the cradle may be the other addition to our chances for immortality. It will be harder to monopolize communication between the Earth and Moon than Earth and Mars. This will create a free flow of ideas that will benefit both societies. There will be a greater spirit of freedom sooner with lunar colonization due to speedier development, and the faster mixing of ideas. Colonizing the Moon will also be a faster spur to legal development. The development of space law, especially property rights, mineral rights, and to a lesser extent labor law and human rights will create additional liquidity for other space colonization activities. The Moon may make a Mars colony feasible or desirable, thus enabling three branches of humanity. Having independent space nations will enrich the solar system polity and make the solar system and the species more secure from natural disaster. We can speed interstellar exploration and colonization. Ultimately we may create two new worlds that are every bit as rich, varied and interesting as our own. The Moon is a very interesting destination in its own right. Being closer to the Earth creates engineering, economic, and political opportunities. The Moon may make a Mars colony feasible or desirable, thus enabling three branches of humanity. A lunar colony can use much more mass imported from Earth and more flexible and capable engineering. Tourism may independently justify lunar colonization, but science, technology, skills and entertainment make the case stronger. Having a new place to live with new laws, customs, and ideas may ultimately be the most valuable contribution of all.

### Moon must come before Mars: Distance.

Benaroya 01(Haym July 7th, Professor Mechanical and Aerospace Engineering at Rutgers University: PROSPECTS OF COMMERCIAL ACTIVITIES AT A LUNAR BASE- http://coewww.rutgers.edu/~benaroya/publications/ssdj.pdf)

The raging battle amongst the converted is whether to include the Moon on the way to Mars. The Mars-First crowd deems the Moon to be, at best, a diversion from the real goal of colonizing Mars. The Moon-First-on-the-way-to-Mars group also supports the eventuality and dominance of a Martian civilization. However, it is clear that there are clear benefits from colonizing a planetary body three days from Earth versus one that is about a year away. From any perspective except public relations, the clear and rational way for Man into Space is via the Moon. Mars Direct ignores critical technical and physiological issues that are unresolved, pretending that existing technology need not be tested extensively before being sent on a yearlong mission to Mars with humans.

## Solvency- Technology

### We have the tech to colonize the moon

Benaroya 01(Haym July 7th, Professor Mechanical and Aerospace Engineering at Rutgers University: PROSPECTS OF COMMERCIAL ACTIVITIES AT A LUNAR BASE- http://coewww.rutgers.edu/~benaroya/publications/ssdj.pdf)

Existing industries have a significant role in lunar development. Certainly, these industries will be the backbone of early development. However, in planning a project that will not complete its first phase of operation before about two decades, new industries are anticipated for which early stages of technical development are necessary. The technological issues for lunar development are relatively well understood. Of course, there will be debates on technical options. For example, should the prototypical lunar structure be inflatable, a truss, or within a lava tube? Nevertheless, once a choice is made, the technical issues can be addressed, even if this means that new technologies need to be developed. The long-term biomedical issues are less well understood and require continued investigation. In order for the proposed paradigm to be successful, a significant percentage (dollar wise) of the technologies must be dual-use, meaning that they not only have a role in lunar development, but also have a more immediate civilian or other application. Detailed charts of potential dual-use technologies are provided at the end of this paper. As examples, the following are promising dual-use technological arenas for investment: Self-repairing systems can be used to help safeguard systems that are hit by micrometeorites in Space and on the Moon. Such systems can also be utilized in monitoring and repairing micro-cracks in aircraft fuselages and other mechanical components. Materials development and processing are amongst the most economically valuable scientific and engineering activities because of the importance of new materials in our world. The same is true for technology developments for Space application. Low gravity and microgravity technology will be developing as a result of our experience with the Space station. Such capabilities, whether for fluid mechanical applications or materials processing and handling in such conditions, will become extremely important for the practicalities of spacefaring. Robotic manipulators have very broad applications. In Space and on the Moon they could be extremely useful in minimizing the workload of the astronaut construction corps. They also can be used in delicate manipulations such as medical procedures and hazardous material handling. Instrumentation is an industry with broad application. Two possible areas for investment are the monitoring of material integrity, and fluid flow control. Both have significant dual-use possibilities. Micro and nano devices are those of a size that approach the smallest of scales, even the molecular and atomic scales. Potential applications include the tiniest computers, and the strongest and lightest materials. Such devices would revolutionize manufacturing, electronics, materials, and medical procedures. The applications to the Space and terrestrial economies would be immense. The above list is only a sample of possibilities. Once very focused and specific studies are initiated, this list would grow by orders of magnitude and it will become clear which technologies have the highest potential for dual-use and, therefore, rate of return. These technologies will form the backbone for technology development. Some of these profits will help support the less profitable, but necessary, technologies that must also be developed. In this way, the necessary resources can be accumulated for early lunar development. LDC will evolve as an organization that resembles a venture capital holding company, with the ultimate goal of lunar development. Intermediate goals include appropriate technology development and the earning of profits for investors and for LDC. The long-term goal is an expedition to the Moon, to stay.

## Solvency- Technology/Resources/Food

### **Tech is available for necessary purposes**

JÄRVSTRÅT 02(Niklas March-April, Ph.D. on high temperature behavior of metals “Ad Astra: To the Stars” http://moon-isru.com/information/AdAstra2002.pdf)

Having determined that a self-sufficient lunar colony is desirable and that all resources needed are present, the next step would be to quantify and break down the material requirements for Human Survival such a colony. Starting with the short-term sur- vival requirements of air, water and food, some additional requirements directly concerned with human activities are easily identified at the first level, as shown in the figure on the preceding page. The basic survival requirements will inevitably lead to a production complex — stone-age humans could survive on earth only because the ecosystem did not require human surveillance. We are not that lucky on the Moon — although the necessary energy and raw materials exist on the lunar surface, they are not available without signif- icant effort. And, although the very latest in mod- ern technology might be unobtainable luxuries for a budding lunar colony, an industrial production complex will be necessary to replenish raw materi- als lost to vacuum or diluted beyond usefulness. The technologies needed to extract crucial elements from lunar soil, to maintain an artifi- cial ecosystem exist today and have been tested on a small scale. Technologies for producing goods and equipment needed in daily life are in principle identical with the same processes cur- rently in use on Earth, and would only need minor adaptions. A recent NASA financed study on the concept of a self-sufficient lunar colony (SSLC) indicates that with losses of standard atmosphere compara- ble to recent space vessels, nitrogen replacement will be the severely limiting factor in supporting the lunar colony. For replacing 0.5 % daily atmos- pheric losses, it would be necessary to process more than 400 metric tons of lunar soil per person each day. Even if the observed hydrogen at the lunar poles were in the form of nitrogen-rich cometary ices, more than 100 kg per person each day would still be necessary. However, with improved airtightness to 0.1 % daily losses and replacing most nitrogen losses with “cheaper” gasses (such as oxygen), the regolith processing requirements would come down to a reasonable less than 1kg per person each day. It is possible that more regolith than 1kg/person would be needed to extract raw materials for ongoing man- ufacturing processes, though the necessary calcula- tions remain to be performed. Anyway, it seems like the manufacturing requirements for a lunar colony may be brought down to manageable levels by careful planning and judicious housekeeping. Interestingly, the same approach as will be necessary for managing the lunar colony production also seems to give valuable information for reducing environmental impact and improving resource efficiency on Earth.

## Solvency- Moon Sustainability

Moon colonies would become self-sustainable

Orbitec (ORBITAL TECHNOLOGIES CORPORATION December 2006 <http://www.orbitec.com/documents/SSLC_2006.pdf>)

The first purpose of the SSLC is to establish a permanent human presence on the Moon with a minimum need for supplies from Earth. The second purpose would be to serve as a test-bed for technologies that would be in common between the SSLC and an eventual Mars base. The SSLC is intended to fully utilize lunar resources. The colony would be considered “self-sustaining” when it can achieve the goal of surviving without any supplies from Earth for 52 months. This represents the period a Mars colony would need to survive between supplies missions from Earth, assuming one missed re-supply mission opportunity. The SSLC would need to produce and recycle all of the consumables required over that time. It must also maintain all of the modules, facilities, and equipment. We have assumed that the SSLC would have a steady-state population of 100. The Lunar colonists are considered to be permanent residents for a minimum period of 52 months. The colony could become self-sustaining without becoming completely isolated from the Earth. For example, scientific and technical equipment needed for further science, exploration, and extension of operations could be supplied. Communications and electronic data transfer with Earth would be extensive. The SSLC would be located at the southern pole of the Moon. There are several reasons to choose this location. First, data from the Lunar Prospector indicated significant amounts of frozen water ice, or at least bound hydrogen, at both of the Lunar poles in cold traps where the Sunlight is severely limited or non-existent (bottoms of craters and depressions). This resource will provide a valuable feedstock for H2O, O2, and fuel to support lunar surface activities, provide life support consumables, and allow transportation back to the Earth. Second, there are several areas at the South Pole that receive near-constant Sunlight. Two locations near the Shackleton crater at the lunar South Pole have been identified that collectively receive sunlight for ~98% of the time, making those excellent sites for the SSLC and the associated solar power systems. The availability of near continuous power eliminates the need for long-term energy storage. Third, the temperature environment is much more consistent than other non-polar lunar sites, with few dramatic temperature shifts. Surface temperatures at the South Pole remain close to –53 +/- 10 C. Other places on the Moon, outside of the poles, can see temperature swings over 400 C during Lunar day to night cycle. The small changes in temperature will simplify the thermal control system requirements of the SSLC and reduce cyclical thermal stresses. Electrical and thermal energy for the colony is proposed to be initially supplied by a combination of nuclear power plants (two ≥ 1 MW plants) and solar energy. The CELSS, Closed Ecological Life Support System, would provide all the atmospheric requirements for living on the Moon. The food acreage is sized to support 100 people. Dust has been identified as a significant problem during the Apollo missions. All attempts will be made to prevent the entry of dust into the habitat volume. Robotics and automated processes would be extensively used for surface construction and maintenance of the SSLC facilities. Telecommunications, navigation and information management are other important requirements. For a more complete description, see the NIAC website for the final report.

## Solvency- Resources

### The Resources for a permanent colony are available on the moon

JÄRVSTRÅT 02(Niklas March-April, Ph.D. on high temperature behavior of metals “Ad Astra: To the Stars” http://moon-isru.com/information/AdAstra2002.pdf)

On the Moon, all that is needed for human life is present: energy and raw materials. Energy is available directly from the sun — since there is no atmosphere the intensity is almost 1400 W/m2. At the lunar equator, storing energy for the lunar night of 330 hours could be a problem, but near the south pole peaks of “eternal light” are avail- able to give an almost continuous power supply. Raw materials are available in the rich lunar soil (regolith), covering the surface of the Moon to a depth of 5-10 meters. In particular, common construction metals are available in high concen- trations, as well as silicon and other important non-metals for use in solar cell manufacture and other purposes. Creating a breathable atmosphere will not pose a problem, as oxygen is the most abundant element in the lunar soil and will be obtained as a by- product in almost any soil refine- ment process. The only real difficulty with the lunar soil composition is the very low amounts of the lighter elements: carbon, hydrogen and nitrogen, which have been lost to the vacuum of space. Fortunately, the detection of hydrogen at the lunar poles hints at comet ices being trapped in the perpetual cold and shadow of the polar craters. Icy comets have been found to contain high concentrations of not only water ice (H2O), but also ammonia (NH3), methane (CH4) and formaldehyde (H2CO). Thus, the elements lacking in mare and highland soils can be supplied by ice rich polar soil. Additional “resources” found on the Moon that will facilitate some manufacturing processes are the readily available high quality vacuum and low grav- ity: Alloy purity does benefit from casting in vacu- um and mixtures will be more stable with less grav- itation to pull constituents apart. To summarize: Solar energy is abundant with- out an atmosphere to dissipate it, water reservoirs are frozen at the poles, common construction met- als are plentiful, and all base elements needed for biological life are present in reasonable quantity.

## Solvency- Mars General

### Mars is sustainable and possible to colonize

Zubrin 96(Robert July/August: The Case for Colonizing Mars- http://www.nss.org/settlement/ mars/zubrin-colonize.html)

Among extraterrestrial bodies in our solar system, Mars is singular in that it possesses all the raw materials required to support not only life, but a new branch of human civilization. This uniqueness is illustrated most clearly if we contrast Mars with the Earth's Moon, the most frequently cited alternative location for extraterrestrial human colonization. In contrast to the Moon, Mars is rich in carbon, nitrogen, hydrogen and oxygen, all in biologically readily accessible forms such as carbon dioxide gas, nitrogen gas, and water ice and permafrost. Carbon, nitrogen, and hydrogen are only present on the Moon in parts per million quantities, much like gold in seawater. Oxygen is abundant on the Moon, but only in tightly bound oxides such as silicon dioxide (SiO2), ferrous oxide (Fe2O3), magnesium oxide (MgO), and aluminum oxide (Al2O3), which require very high energy processes to reduce. Current knowledge indicates that if Mars were smooth and all its ice and permafrost melted into liquid water, the entire planet would be covered with an ocean over 100 meters deep. This contrasts strongly with the Moon, which is so dry that if concrete were found there, Lunar colonists would mine it to get the water out. Thus, if plants could be grown in greenhouses on the Moon (an unlikely proposition, as we've seen) most of their biomass material would have to be imported. The Moon is also deficient in about half the metals of interest to industrial society (copper, for example), as well as many other elements of interest such as sulfur and phosphorus. Mars has every required element in abundance. Moreover, on Mars, as on Earth, hydrologic and volcanic processes have occurred that are likely to have consolidated various elements into local concentrations of high-grade mineral ore. Indeed, the geologic history of Mars has been compared to that of Africa, with very optimistic inferences as to its mineral wealth implied as a corollary. In contrast, the Moon has had virtually no history of water or volcanic action, with the result that it is basically composed of trash rocks with very little differentiation into ores that represent useful concentrations of anything interesting. You can generate power on either the Moon or Mars with solar panels, and here the advantages of the Moon's clearer skies and closer proximity to the Sun than Mars roughly balances the disadvantage of large energy storage requirements created by the Moon's 28-day light-dark cycle. But if you wish to manufacture solar panels, so as to create a self-expanding power base, Mars holds an enormous advantage, as only Mars possesses the large supplies of carbon and hydrogen needed to produce the pure silicon required for producing photovoltaic panels and other electronics. In addition, Mars has the potential for wind-generated power while the Moon clearly does not. But both solar and wind offer relatively modest power potential — tens or at most hundreds of kilowatts here or there. To create a vibrant civilization you need a richer power base, and this Mars has both in the short and medium term in the form of its geothermal power resources, which offer potential for large numbers of locally created electricity generating stations in the 10 MW (10,000 kilowatt) class. In the long-term, Mars will enjoy a power-rich economy based upon exploitation of its large domestic resources of deuterium fuel for fusion reactors. Deuterium is five times more common on Mars than it is on Earth, and tens of thousands of times more common on Mars than on the Moon. But the biggest problem with the Moon, as with all other airless planetary bodies and proposed artificial free-space colonies, is that sunlight is not available in a form useful for growing crops. A single acre of plants on Earth requires four megawatts of sunlight power, a square kilometer needs 1,000 MW. The entire world put together does not produce enough electrical power to illuminate the farms of the state of Rhode Island, that agricultural giant. Growing crops with electrically generated light is just economically hopeless. But you can't use natural sunlight on the Moon or any other airless body in space unless you put walls on the greenhouse thick enough to shield out solar flares, a requirement that enormously increases the expense of creating cropland. Even if you did that, it wouldn't do you any good on the Moon, because plants won't grow in a light/dark cycle lasting 28 days. But on Mars there is an atmosphere thick enough to protect crops grown on the surface from solar flare. Therefore, thin-walled inflatable plastic greenhouses protected by unpressurized UV-resistant hard-plastic shield domes can be used to rapidly create cropland on the surface. Even without the problems of solar flares and month-long diurnal cycle, such simple greenhouses would be impractical on the Moon as they would create unbearably high temperatures. On Mars, in contrast, the strong greenhouse effect created by such domes would be precisely what is necessary to produce a temperate climate inside. Such domes up to 50 meters in diameter are light enough to be transported from Earth initially, and later on they can be manufactured on Mars out of indigenous materials. Because all the resources to make plastics exist on Mars, networks of such 50- to 100-meter domes couldbe rapidly manufactured and deployed, opening up large areas of the surface to both shirtsleeve human habitation and agriculture. That's just the beginning, because it will eventually be possible for humans to substantially thicken Mars' atmosphere by forcing the regolith to outgas its contents through a deliberate program of artificially induced global warming. Once that has been accomplished, the habitation domes could be virtually any size, as they would not have to sustain a pressure differential between their interior and exterior. In fact, once that has been done, it will be possible to raise specially bred crops outside the domes. The point to be made is that unlike colonists on any known extraterrestrial body, Martian colonists will be able to live on the surface, not in tunnels, and move about freely and grow crops in the light of day. Mars is a place where humans can live and multiply to large numbers, supporting themselves with products of every description made out of indigenous materials. Mars is thus a place where an actual civilization, not just a mining or scientific outpost, can be developed. And significantly for interplanetary commerce, Mars and Earth are the only two locations in the solar system where humans will be able to grow crops for export.

## Solvency- Mars Colonization

### Mars colonization is possible: Terraforming

Juan 94 (Stephen July 13, B.A. in Anthropology, an M.A. in Education: “Look out Mars, here we come” http://www.lexisnexis.com.turing.library.northwestern.edu/hottopics/lnacademic/)

SERIOUS plans are under way that may lead to the colonisation of the planet Mars sometime in the 21st century.

In the January 1994 issue of Technology Review, writer David Chandler reports on the recent National Aeronautics and Space Administration (NASA)developments for future Martian colonisation which are being undertaken in conjunction with the aerospace company Martin Marietta. These plans are centred on what is called "terraforming" - building a biosphere on what is now seemingly lifeless, forbidding, red rock. According to writer Jeremiah Creedon in the July/August 1994 issue of the Utne Reader, NASA and Marietta scientists have "drawn up a scenario, beginning with plans to trigger a massive global climate change on Mars". "Planners say this first step towards greening the red planet lies within the reach of present technology," Creedon writes. "Huge factories running on nuclear fuel would fill the Martian skies with greenhouse gases. "Within decades, the frigid climate and low atmospheric pressure would give way to an environment suitable for humans. Water would flow, thanks to the melting of polar ice." The scientists are also working on how to get to and from Mars safely. This is no easy task. Mars is 35 million miles away and any journey would take years to complete each way, given present technology. In addition, omens for travel to Mars are not exactly bright. Last August, NASA lost contact with the $1.3 billion Mars Observer spacecraft just days before it was to begin orbiting the Red Planet. Undeterred, scientists from both organisations say it is only a matter of time and money before the many technical problems of Martian colonisation will be overcome. Nevertheless, while the technical problems are being addressed, there is debate within NASA and Marietta about whether the human colonisation of Mars should even be attempted. Chand ler quotes NASA scientist Christopher McKay as favouring the terraforming concept, but not wanting humans to colonies.

McKay fears that humans would eventually doom any life form that may exist on Mars. He argues that the human record of saving species from extinction on Earth has hardly been impressive, saying "humans are the skin rash of the planet Earth - aggressive, hostile, brutal". As such, McKay does not want our destructive ways spread beyond our present atmosphere. On the other side of the debate is Marietta scientist Richard Zubrin. Zubrin argues that colonisation must go ahead since "humanity's destiny is to explore and expand, and Mars is far too desirable a potential home for our species to be left alone". Of course, a less ambitious first step in outer space colonisation is already well under way with NASA's plans for the creation of space station Alpha. Progress on the space station is proceeding quietly but steadily. A story in Science News says that the White House has decided to cap spending on the space station at $2.9 billion. Another issue of Science News says the US is to build the space station with the Russians as a symbol of goodwill between the two countries. The assembly of space station Alpha is to be finished by 1997 and will involve 19 construction flights by NASA space shuttles and a further 12 by the Russians. Japan and several European countries are contributing various features of the space station's many modular components. A dozen or more humans will live and work in outer space for up to several years when the station is completed. The 25th anniversary of the first Moon landing reminds us that we humans are colonisers. We love to spread our kind to any place where it is not. Perhaps there is some as yet undiscovered gene for this trait? We can only guess until the human genome project, which aims to map all our genes, is complete.

And that should be finished the same year as Alpha.

## Solvency- Travel

### Tech for fast travel available in squo: Ion Drive

### London Daily Telegraph 04(Sept. 08, Ions drive space probe: Advent of new engine technology could pave way for eventual colonization of moon and Mars: http://www.lexisnexis.com.turing.library. northwestern.edu/lnacui2api/results/docview/docview.do?docLinkInd=true&risb=21\_T12347408961&format=GNBFI&sort=RELEVANCE&startDocNo=1&resultsUrlKey=29\_T12347408967&cisb=22\_T12347408966&treeMax=true&treeWidth=0&csi=8355&docNo=11)

A spacecraft engine with echoes of Star Trek has has been taken on its first test drive across the solar system, scientists said.

Results from the European Space Agency's Smart-1 moon probe have confirmed that the pioneering "ion drive" is more efficient than traditional chemical blasters. Scientists believe ion drive engines might one day power massive cargos across vast distances - paving the way for the colonization of the moon and Mars. Smart-1, which is the size of a washing machine, was launched a year ago. Its ion drive uses power from the sun to fire a stream of charged atoms. The thrust of the engine is the equivalent to blowing gently on a hand. But because the ions are being released continuously, the craft speeds over several weeks. Bernard Foing, the chief Smart-1 scientist, said Smart-1 would soon be sending back the first images of the far side of the moon captured by a western European craft. An ion-drive engine will be used in two more European missions - to Mercury in 2012 and to the sun in 2014.

## Solvency- Orbital Colonies

### Orbital Colonies are easily feasible: Tech and problems have been fixed.

### Space Settlement.com 09 (Orbital Space Settlements, http://www.thespacesettlement.com /orbitalspacesettlements.html)

Unlike astronauts in space stations, people will consider their orbital space colony home, although they may visit Earth from time to time. A colony is a place to live, work, play, raise a family, argue with the neighbors, and grow old in low-g comfort.

Since space colonies are for permanent living, not just a few month's work, they must be much larger. In this article we will discuss several space settlement designs, all include habitable areas a kilometer (nearly a mile) or more in size. This is much larger than the space stations described above, which are all a few tens of meters long at best. Thus, orbital space settlements are expected to be about 100 times larger than today's space stations. Space stations have small crews, usually only a few people. Supplies of air, water, and food can be brought from the ground with limited recycling. The colony designs we examine here are for thousands of people, and this means there are a few minor problems to solve :-). For example, space has no air, no water, no food and it's way too difficult to bring enough up for thousands of people. In addition, in the sun it is far too hot and in the shade it's unbelievably cold. There's also quite a bit of radiation. All the great stuff the Earth provides more-or-less for free: air, water, reasonable temperatures, radiation protection, and even gravity need to be provided by the space colony. The first priority is something to breathe. The colony must be filled with air and the hull (the outermost shell) must be air-tight. If the hull leaks much, the colony will lose its atmosphere and become unlivable. Since outside the hull is a vacuum, the atmosphere on the inside will push outwards on the hull, which must be strong enough to withstand the air pressure. At sea level on Earth air pressure is about ten tons for every square meter (roughly a square one yard on each side). However, people can breathe perfectly well in the mountains where the air pressure is much less, so less dense air pushing with six to seven tons per square meter should be adequate. Fortunately, we have been building small, air- tight spacecraft for over forty years now, we just need to make them bigger. Unfortunately, just being strong enough to hold the air in isn't enough. To get something resembling gravity we need to spin the colony and that puts even more stress on the hull. Astronauts in the ISS don't weigh anything. They just float around, which is great fun. However, even though astronauts exercise for hours every day, weightlessness causes muscles and bones to atrophy. Our bodies only stay strong when they work, and removing the stress of Earthly gravity reduces the workload a great deal. Some astronauts become so weak they can't stand up when they get back to Earth. No one has any idea what would happen to children raised in weightlessness, but it's a safe bet they will never visit Earth, even for an all-expense scholarship to Harvard. Without the stress placed on a growing body by Earth-normal gravity, bones and muscles will have no reason to develop strength and power. Fortunately, we can get something that feels a lot like gravity by rotating our colonies. This is called pseudo-gravity. Living in Earth-normal pseudo-gravity should allow adults to keep their strength and children to develop it. The need for pseudo-gravity puts additional stress on the hull, but, as luck would have it, we already know how to make materials that are plenty strong enough. Currently available materials are perfectly adequate to build colonies up to a few kilometers across or so. This is about the size of a California beach town. A population of ten or twenty thousand will fit quite nicely. Credible designs even exist for colonies many tens of kilometers across with populations in the millions, but the first colonies will almost certainly be smaller.

Orbital space colonies could be large and contain stable ecosystems

Engdahl 2008(Sylvia, Author or many novels on space settlements. November 5, 2008. <http://www.sylviaengdahl.com/space/survival.htm>) hss

And meanwhile, the space-dwellers producing all these things cheaply for Earth would be getting rich, because they would not be citizens of Earth nations; they would be citizens of their own orbiting colonies, entitled to the full proceeds of their labor. Eventually, they would be rich enough to fund interstellar expeditions. And their living conditions would not be what you’re imagining if you’re picturing Deep Space Nine. Orbiting colonies— probably the most difficult concept to understand if you haven’t seen any of the artists’ renditions—would be little worlds built from extraterrestrial materials, with the living space on the inside of the sphere. They would be complete biospheres with trees and lakes and gardens, much less crowded and less sterile than New York City. Many of their advocates have said that having once lived that way, humans would never want to live on the surface of a planet again, and that if they traveled to a new planet, they’d go to its surface only to explore.

## Solvency- Orbital Colonies (Science)

### **Orbital Colonies are scientifically possible**

Globus 03(Al Globus, Has worked for NASA and the ESA for years: “Orbital Colonies” http://space.mike-combs.com/excerpts.html)

Humanity has the power to fill outer space with life. Today our solar system is filled with plasma, gas, dust, rock, and radiation -- but very little life; just a thin film around the third rock from the Sun. It's time to change that. In the 1970's Princeton physicist Gerard O'Neill with the help of NASA Ames Research Center and Stanford University showed that we can build giant orbiting spaceships and live in them. These orbital space colonies can be wonderful places to live; about the size of a California beach town and endowed with weightless recreation, fantastic views, freedom, elbow-room in spades, great wealth and true independence. We can be life's taxi to the stars -- or at least to the rest of this solar system. Given the will, mankind can build first-class orbital real estate sufficient for perhaps a trillion people to live in luxury. If this sounds ridiculous, consider your great-great grandfather's reaction if you told him that by the year 2000, hundreds of millions of people would fly each year. When the first American landed on the moon in 1969 after only eight short years of intense effort, the National Aeronautical and Space Administration (NASA) proved that we could do nearly anything consistent with the laws of physics. A few years later, Princeton physicist Gerard O'Neill and others showed that orbital space colonies were physically possible (Johnson and Holbrow, 1975) (O'Neill, 1977). Dr. O'Neill's analysis strongly suggested that asteroids and lunar mines could supply the materials, the Sun could provide the energy, and that our technology had nearly reached the point where we could build orbital cities. These cities could be placed anywhere in the solar system, although beyond Mars nuclear power might need to replace solar energy. O'Neill speculated that we would be well on the way to building orbital colonies by now. We aren't. here were two flaws in Dr. O'Neill's vision, both of which can be fixed. First, transportation is vital and he assumed that NASA's space shuttle would function as advertised, including a planned fifty flights per year at a cost of $500 per pound to orbit; this turned out to be false. Second, even with the promised transportation system, Dr. O'Neill knew that building the first colony would involve a titanic up-front financial investment. This investment would take decades to generate any return, much less a profit. Orbital Space Colonies follows in Dr. O'Neill's footsteps with improvements; showing how to develop the necessary transportation and colonize the solar system with merely an extremely large investment; but one that produces some returns fairly quickly.

## Solvency- Mars- Water

Water is on Mars

O’Neil ’08(Ian, writer for universe today quoting interview with Dr. Adrian Brown, Searching for Water and Minerals on Mars – Implications for Colonization, Universe today,http://www.universetoday.com/14037/searching-for-water-and-minerals-on-mars-implications-for-colonization/)JL

In a timely news release, the CRISM mission site has announced new results to come from the analysis of the mineral distribution at the bottom of Candor Chasma (pictured), part of the vast Valles Marineris. Candor Chasma is a deep, long and steep-sided valley about 813 km (505 miles) long and has been cited as a possible location for the Hillside Settlement concept as conceived by the Mars Foundation. In fact, this settlement concept was the inspiration behind the first permanent settlement aptly called “Underhill” in Kim Stanley Robinson’s epic novel Red Mars. So, there is obvious interest as to what Candor Chasma can offer the colonists inhabiting the Hillside Settlement with easy access to locally mined minerals. The CRISM instrument has discovered quantities of sulfate and pyroxene rich deposits in the region, useful for many industrial processes. In our interview, Dr Brown outlined other important minerals that CRISM has found and some of their common uses here on Earth: **“**These [minerals] include kaolinite (chinaware is made of this mineral), talc (the main constituent of many soaps) and hydrated silica (perhaps like chert, which Indian knives were carved out from). The small amounts of these minerals means it has been impossible to discover them before CRISM, and previously they were discounted in all our modelling of Mars.” – Dr Adrian Brown, SETI Institute principal investigator and CRISM scientist. For me, the most revealing part of our conversation was Brown’s estimate on the sheer quantity of water held as ice in the north polar cap. **The north pole hides under a 1000 km (**620 mile) diameter disk **of near-pure water ice** (with some impurities like sand and dust, giving a pink hue). This disk is 3 km (1.9 miles) high, holding staggering 2.35 million cubic kilometers of water**.** That’s **enough water to cover the continental US to a depth of 200 meters**! Throw in the water that is held at the south pole (a carbon dioxide/water ice disk 300 km in diameter and 2 km high) and we’re looking at the equivalent volume of water ice held in the Greenland ice sheet (or 500 times less than the amount of water in our oceans**)**. It’s not that hard to imagine that if a permanent Mars colony is established, mining operations for water ice would be common. But it doesn’t stop there; water could also be extracted from the atmosphere.One of Dr Brown’s studies focus on measuring the variation of water ice crystals in the clouds throughout the seasons. There should also be quantities of water vapour in the warmer equatorial regions.There is also the possibility of extracting water from the permafrost layers below the Martian regolith. The Phoenix Mars lander (set to arrive at the Red Planet on May 25th) will be able to investigate the possibility of sources of frozen water below the surface. Dr Brown also indicated that the observations by the Mars Orbital Camera (on board NASA’s Mars Global Surveyor, lost in November 2006) of apparent gullies may reveal the location of possible sub-surface aquifers (after gushing across the surface) for future colonists to “tap” into (pictured). However, there have been studies that dispute this in favour of dry debris flows creating the gullies, but a definitive answer will not be arrived at until the gullies are analysed in-situ. And if he had the chance, I think Dr Brown would be the first to look into this exciting possibility after I asked him the question: Would you like to go to Mars?

Mars Colonization key to Solar System Colonization

Ker ’05(Than, Masters Degree from NYU, The Homestead Project: Making a Mars Settlement a Reality, Space.com, <http://www.space.com/1419-homestead-project-making-mars-settlement-reality.html>) JL

One possible scenario, the group proposes is to send small gas tanks ahead that store methane and oxygen extracted from the atmosphere. When the settlers arrive, they can then use that equipment and stored gas to build things like steel production plants. Finally, **Mars** will **be an integral part of** an inter-**solar system economy** that the group believes will develop within the next century,one **based on** the convergence of four frontiers**: Earth, the Moon, asteroids, and** Mars--including its own rocky satellite**s, Phobos and Deimos.** **Mars will catalyze the development of the other frontiers**, said Homnick, acting as a supply house for vital resources like nitrogen, carbon dioxide and water for the moon and asteroids, places where such things are scarce or nonexistent. **Many of the technologies developed for use on Mars will also have applications for the other frontiers**, the group said. For example, life support systems and mining equipment developed for use on Mars could also be used on the moon. The group strongly supports President Bush's Moon, Mars and Beyond vision and said they are not trying to compete with NASA or any other space organization. "We kind of look at NASA and the European Space Agency as analogous to Lewis and Clark in the old west," Homnick said. "They blaze the trail, go out to explore and do the science. Well, we are analogous to the pioneers--we follow the trail that they blazed, and we make the new frontier home and we add value." Instead, the group believes that different agencies can benefit from one another and the colonization of space can be sped up. "We hope they succeed because they'll help us succeed," said Palai.a

## Solvency- Mars Springboard

Mars Colonization key to Solar System Colonization

Ker ’05(Than, Masters Degree from NYU, The Homestead Project: Making a Mars Settlement a Reality, Space.com, <http://www.space.com/1419-homestead-project-making-mars-settlement-reality.html>) JL

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# \*\*\*OFFCASE

# EU CP 2AC

## AT: EU CP

### Russia may beat the US to He3- gives them power in resource wars

Daily Record 06 [Stephen White, 1/28/06, “THAR'S GOLD IN THAM LUNAR HILLS; HELIUM 3 COULD HOLD KEY TO THE FUTURE OF SPACE EXPLORATION. IT COULD BE THE 'CASH CROP' FOR THE MOON”, LexisNexis]

RUSSIA is planning to beat America back to the Moon to mine for an abundance of untapped riches. But it's not gold or diamonds they aim to bring back to Earth. It's rare and precious helium 3 (chemical symbol He3) which could provide our planet with an almost limitless source of clean energy. No Russian has ever walked on the lunar surface and the last Americans went there in Apollo 17 in 1972. Now leaders in Moscow hope to beat America's 2018 target to return, set in 2004 by President Bush, by three years. They aim to set up a permanent base and scoop up helium 3 which will transform our power supplies. There are few deposits on Earth, but it is abundant on the Moon, with estimates in millions of tons. And just 25 tons could power a country like America for a year. Nikolai Sevastyanov, head of Russia's giant Energia Space Corporation, said: "We are planning to build a permanent base on the Moon by 2015 and by 2020 we can begin the industrial-scale delivery of helium 3." The Russian government have approved plans to build their own rival to the space shuttle and have at last said they'd come up with the cash. The pounds 1billion Kliper - Clipper in our language - will replace the ageing Soyuz spacecraft and will carry six cosmonauts. Helium 3 is deposited on the Moon's powdery soil by a wind of charged particles from the sun. Gerald Kulcinski, of Wisconsin University, in the US said: "Helium 3 fusion energy may be the key to future space exploration and settlement. "It could be the cash crop for the Moon." Helium 3 could be an efficient fuel for nuclear fusion reactors which are still under development. Scientists believe the Moon's rich resources of helium 3 could be used in futuristic fusion reactors on Earth that would generate electricity without producing nuclear waste. Such fusion technology could also power rockets for deep-space travel in the future. The scientists also estimate that the greatest amounts of helium 3 will be found on the far side of the Moon. Helium 3 is a stable and lighter version of regular helium gas. It is principally shipped and used as a gas for detectors, lasers, refrigerators and laboratory research. Future prospectors on the Moon could be helped by resource maps developed from research by scientists in Arizona and Hawaii. Some He3 is available on Earth. It is a by-product of the maintenance of nuclear weapons and could continue to produce about 15kg per year in the US alone. The total supply in the US strategic reserves is about 29 kg, and another 187 kg is mixed up with natural gas in storage. In one paper, Kulcinski estimated a total of 1,100,000 metric tons of He3 have been deposited by the solar wind on the Moon. Since the surface has been stirred up by collisions with meteorites, He3 could be found down to depths of several meters. The older soils should be better sources of helium 3 because they have been exposed to the solar wind longer and contain greater amounts of fine-grained aggregates that absorb it. Also, solar wind-implanted particles are more abundant on the far side, because the Earth shields the Moon's near side from the solar wind for part of each solar orbit. Scientists estimate that the great-est amounts of helium 3 will be found on the far side "seas," of the Moon, due to the higher solar wind. Their guess is based on analysis of rock samples brought back by the Apollo astronauts and mineralogic maps produced by the Clementine spacecraft. They expect to refine their maps with new elemental data produced by the Lunar Prospector spacecraft. To extract helium 3 from the lunar soil, the Russians would need to heat the dust to about 600C. However, to extract one ton of helium 3, it's estimated 200million tons of the Moon would have to be processed. And that's equivalent to mining the top two metres of a region 10 square kilometres in area.

### Squo solves the CP- EU is already a major player in space

European Commision 11 [“Space: European Space Policy”, 8/4/11, http://ec.europa.eu/enterprise/policies/space/esp/index\_en.htm]

The European Space Policy will ensure that Europe plays a leading and significant role in space and that space-based technologies maximise benefits to Europe and its citizens. A vision of ' the ambitions of Europe in Space' was outlined by the president of the European Commission, José Manuel Durão Barroso, during a key note speech on 15 October 2009. 11 September 2008 saw the adoption of the European Space Policy progress report [80 KB] . The annex to this report includes elements for a European strategy on international relations in space. On 26 September 2008, the 5th Space Council [149 KB] welcomed the progress made through the implementation of European Space Policy and highlighted new priority areas: space and climate change space's contribution to the Lisbon strategy space and security space exploration. The Council resolution recognised that the EU, alongside the ESA and the member states, is a major player in space. The EU wass charged in particular with strengthening the coordination of resources and programmes with ESA and the member states and the development of EU instruments and funding schemes to allow for long-term EU investment in space. It also takes stock of the progress made under the two European flagship programmes, Galileo and GMES, and invited the Commission to compile an action plan for the setting-up of a GMES programme. In the field of climate change, the Commission was invited to study the needs for full access to standardised data and for increased computing power. In the field of security, the Resolution underlined the need for Europe to equip itself with a capability to monitor and survey its space infrastructure and space debris, with the EU - in conjunction with the ESA and member states - taking an active role in order to define the governance of this capability. Finally, in the field of space exploration, the Commission was tasked with developing a common vision for Europe and its role in this global endeavour.The first step to that end was taken on 23 October 2009 when the 1st EU-ESA International Conference on Human Space Exploration took place in Prague. One year later the Second International Conference on Space Exploration, which was held on 21 October 2010 within the framework of the Belgian Presidency of the European Union, was aimed at defining a common vision for Europe about space exploration. The 6th Space Council , held on 15 June 2009, focused on the contribution of Space to innovation and competitiveness. At the 7th Space Council , which took place on 25 November 2010, Ministers of the EU and ESA Member States adopted a resolution on “Global challenges: taking full benefit of European space systems”.

### EU space policy causes arms race- Galileo

The Telegraph 08 [Urmee Khan 11/21/08, “EU developing 'militarised' space policy which could trigger 'arms race'”, http://www.telegraph.co.uk/news/worldnews/europe/3493260/EU-developing-militarised-space-policy-which-could-trigger-arms-race.html]

The European Union is developing a military space policy which has the "potential for an arms race", a report has claimed. The European Space Agency is accused of developing technology to dominate the "high ground" of space, including a multimillion pound EU Satellite Centre in Spain. The Transnational Institute, a Dutch think-tank, said: "EU-financed communication and spy satellites are slowly becoming reality and in the long term the inclusion of space-based missile defence and other more offensive uses of space are real options for an increasingly ambitious EU military space policy." The report said French ambitions for the "militarisation of space" have led to arguments with Britain - particularly over Galileo, the much-delayed European global positioning system. President Nicolas Sarkozy of France, who currently holds the Presidency, said in June that space agenda was one of his priorities. Next week, ministers from all ESA member states will meet in The Hague to implement a new European space policy which identifies military "security" as a priority. Galileo would be vital in any European deployment of the sort of GPS-guided artillery now being used by the US in Iraq and Afghanistan. In 2002, the EU approved the £2 billion satellite network to break strategic dependence on America and seize the lead in space technology. Galileo was designed to end dependence on America's Global Positioning System, a network of 24 satellites controlled by the American defence department which can be cut off in war or even used as a tool of pressure. At the time, it was said that Galileo would create 150,000 jobs, generating £7 billion in annual revenue for European companies from 2008. British demanded a statement in 2002 to describe Galileo as a "civilian" project that would not threaten the cohesion of Nato. However, author of the new report Frank Slijper, an economist and arms trade specialist, said: "While Galileo is generally presented as a genuinely civilian programme, it now appears highly militarised. "The public denial of these important capabilities shows how much Brussels and many European capitals are afraid to tell the public that Galileo is to become an extremely important tool in future warfare by European military forces," he said.

### EU is not seen as a follower- Galileo solves

The Telegraph 08 [Urmee Khan 11/21/08, “EU developing 'militarised' space policy which could trigger 'arms race'”, http://www.telegraph.co.uk/news/worldnews/europe/3493260/EU-developing-militarised-space-policy-which-could-trigger-arms-race.html]

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### Status quo solves EU economy- Galileo

The Telegraph 08 [Urmee Khan 11/21/08, “EU developing 'militarised' space policy which could trigger 'arms race'”, http://www.telegraph.co.uk/news/worldnews/europe/3493260/EU-developing-militarised-space-policy-which-could-trigger-arms-race.html]

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### Only the perm can solve- only US and EU cooperation can spur space multilateralism

Hitchens 10 [Theresa, United Nations Institute for Disarmament Research, “Multilateralism in Space: Opportunities and Challenges for Achieving Space Security”, http://www.unidir.ch/unidir-views/pdf/pdf-uv-30-33.pdf]

Human activity in space has, from the dawn of the space age, been characterized by a “push me, pull you” dynamic between competition and cooperation. There is no doubt it was the Cold War rivalry between the United States and the then Soviet Union that drove initial efforts to breech the space frontier, and that military competition has long been, and continues to be, a central factor in states’ pursuit of space capabilities. At the same time, even during the height of tensions between the two superpowers, international cooperation in the space exploration and sciences was considered a high priority. Not only did the United States and the Soviet Union seek to cooperate with each other regarding human space flight, but they also reached out to other less-developed space players. This fragile balance between competitive pressures and cooperative benefits has helped to create the foundation for the rapid expansion of global space activities over the last 50 years that has greatly benefitted economic and social development around the world. There are now some 1,100 active spacecraft on orbit and more than 60 states and/or commercial entities owning and/or operating satellites.1 However, the ever increasing usage of space by more and more actors is inevitably leading to pressures on the rather weak body of international legal instruments and multilateral institutions that govern space activities – many of which sprang from the Cold War era and the efforts by the United States and Soviet Union to put boundaries around their military space race. For example, there is more and more competition for the limited resource of frequency spectrum, particularly for satellites in the coveted and ever more crowded geosynchronous (GEO) orbital belt.2 The past 20 years have also seen an explosion in the use of space-related technologies for tactical military applications, such as weapons targeting and real-time imaging, creating potential geopolitical instability among major space players as each seeks to reduce its own vulnerabilities in space and exploit those of potential adversaries. Finally, the February 2009 collision between a working Iridium communications satellite and a defunct Russian Cosmos military satellite – the first-ever collision of two intact satellites that created a very large debris field – spurred concern among satellite owners, operators, and governments about the challenge of tracking, avoiding, mitigating, and removing uncontrolled space debris that threatens satellite operations.3 For all three of these reasons, it is becoming important for multilateral cooperation to avoid harmful competition, accidents, and increased potential for conflict in space, which is legally enshrined as a global commons. This, in turn, increases the need for more attention to, and more focused work by, the three major multilateral institutions aimed at ensuring the global commons of space remains safe, secure, and available for the use of all: (1) the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS); (2) the International Telecommunication Union (ITU); and (3) the United Nations Conference on Disarmament (CD).

### **US aerospace industry is key to US economy**

ITA 11 [International Trade Administration, 6/21/11, “Aerospace industry is Critical Contributor to US Economy According to Obama Trade Official at Paris Air Show”, http://trade.gov/press/press-releases/2011/aerospace-industry-critical-contributor-to-us-economy-062111.asp]

PARIS – Francisco Sánchez, Under Secretary of Commerce for International Trade, addressed national and international groups at the 2011 Paris Air Show to reinforce the President’s National Export Initiative (NEI) and support the U.S. aerospace industry. “The U.S. aerospace industry is a strategic contributor to the economy, national security, and technological innovation of the United States,” Sánchez said. “The industry is key to achieving the President’s goals of doubling exports by the end of 2014 and contributed $78 billion in export sales to the U.S. economy in 2010.” During the U.S. Pavilion opening remarks, Sánchez noted that the aerospace sector in the United States supports more jobs through exports than any other industry. Sánchez witnessed a signing ceremony between Boeing and Aeroflot, Russia’s state-owned airline. Aeroflot has ordered eight 777s valued at $2.1 billion, and the sales will support approximately 14,000 jobs. “The 218 American companies represented in the U.S. International Pavilion demonstrate the innovation and hard work that make us leaders in this sector,” said Sánchez. “I am particularly pleased to see the incredible accomplishments of U.S. companies participating in the Alternative Aviation Fuels Showcase, which demonstrates our leadership in this important sector and shows that we are on the right path to achieving the clean energy future envisioned by President Obama.” The 2011 Paris Air Show is the world’s largest aerospace trade exhibition, and features 2,000 exhibitors, 340,000 visitors, and 200 international delegations. The U.S. aerospace industry ranks among the most competitive in the world, boasting a positive trade balance of $44.1 billion – the largest trade surplus of any U.S. manufacturing industry. It directly sustains about 430,000 jobs, and indirectly supports more than 700,000 additional jobs. Ninety-one percent of U.S. exporters of aerospace products are small and medium-sized firms.

### Aerospace industry is key to the US economy

Colorado Space Coalition 11 [“Aerospace can bolster US economy in challenging times”, http://www.spacecolorado.org/aerospace-bolsters-economy.html]

The aerospace and defense industry is a source of economic strength that should be tapped in the stimulus bill to help lead our nation out of very challenging times, AIA President and CEO Marion Blakey said Jan 15. Speaking during a National Aeronautics Association luncheon, Blakey said one way to take advantage of the industry’s strength would be to include several aviation infrastructure provisions in the bill. "Additional investment would increase the economic benefits our industry provides," Blakey said. Dedicating $4 billion to fast-track implementation of the NextGen air transportation system modernization would reap huge economic and environmental rewards for decades to come. Two other steps the authors of the stimulus should take are making the R&D tax credit permanent and repealing the 3 percent withholding rule. These steps would boost innovation and keep cash generated by the industry in the economy rather than government budgets. "The biggest mistake would be to cut defense and space investments, making our industry a bill payer for other industries that are asking the government to bail them out," Blakey said. "This would diminish our strength and momentum in the recovery and cost thousands of high-paying jobs. And that, I’m sure we all agree, would be a very bad move right about now." Blakey gave an overview of the aerospace industry, highlighting the fact it is still showing modest growth in important measures like overall sales and employment during a timeframe when many other industries have seen dramatic downturns.

### Global warming is a natural cycle- no impact

OSS 11 [Last updated 2011, “Global Warming Natural Cycle”, http://ossfoundation.us/projects/environment/global-warming/natural-cycle]

The idea that Global Warming is a natural cycle is well understood from paleo data covering the past 1 million years. Is there a difference between current climate, and the natural cycle? For the past million years the natural climate has oscillated between warm periods and ice ages. This shifting in and out of warm periods and ice ages is correlated strongly with Milankovitch cycles. In order to understand the difference between natural cycle and human-caused global warming, one needs to consider changes in radiative forcing and how this affects systems on earth such as the atmosphere, vegetation, ice and snow, ocean cycles and related effects.

### Perm solves- promotes multilateralism, climate change

European Commission 11 [Space: International cooperation with the USA, 7/2/11, http://ec.europa.eu/enterprise/policies/space/esp/international-cooperation/usa/index\_en.htm]

Partnership and cooperation with the USA, as one of the EU's strategic space partners, is a priority for Europe. In March 2006, as part of the development of the EU-US transatlantic relationship, a dialogue on civil space cooperation was launched. At the EU-U.S. Summit of June 2005 it was agreed that the European Union and the United States would initiate a “dialogue on civil space cooperation”. This dialogue would, inter alia, promote cooperation in space applications in key areas such as earth observation, satellite navigation, space science and exploration. The first EU-U.S. meeting of this dialogue took place in March 2006. More recently discussion has also extended to cooperation in space situational awareness i.e. protection of critical space infrastructure through tracking of space debris and monitoring of space weather. Chaired by representatives of the European Commission and the U.S. Department of State, these dialogues bring together the key Government departments and agencies active in the space domain. These include the European Space Agency and EUMESTSAT (European Organisation for the Exploitation of Meteorological Satellites) on the European side and NASA (National Aeronautics and Space Administration), NOAA (National Ocean and Atmospheric Administration) and USGS (U.S. Geological Survey) on the U.S. side. Four working groups and an annual plenary meeting have been set up on satellite navigation to address in particular radio frequency compatibility and interoperability, trade and civil applications, cooperation on the next generation of civil satellite-based navigation and timing systems, security issues relating to GPS and GALILEO. In April 2010 a meeting of the EU-U.S. dialogue took place in Washington. Areas discussed include: EU-U.S. cooperation in Earth observation (EO) both bilaterally and through international organizations; the need to promote full and open exchange of civil EO data and geospatial information; possible expansion of existing ESA and NASA cooperation in space exploration and space science. At the April 2010 space dialogue, it was agreed to organize an EU - U.S. workshop to identify areas for EU and U.S. cooperation in the use of space infrastructure and applications to combat climate change. This meeting will take place in spring 2011. It is anticipated that a subsequent meeting of the space dialogue will identify the priority areas addressed at the workshop and endorse a roadmap for their implementation. For satellite navigation systems, U.S.-E.U. cooperation is based on the Agreement signed on 26 June 2004 between the Government of the United States of America and the European Community on the promotion, provision and use of Galileo and GPS satellite-based navigation systems and related applications . Since 2006, meetings of high level EU and U.S. space officials have taken place at least once per year to review and prioritise actual and potential areas of cooperation between the EU and the United States in all areas of civil space cooperation. In 2008 the first US-EU Plenary Meeting on satellite navigation took place in Washington. The next meeting is expected in Europe early 2011. In July 2010, a Working Group meeting allowed the conclusion of an initial phase of consultations between the EU and US affirming user interoperability and enhanced performance of combined GPS and Galileo receivers. The result of these consultations is the public release of two papers (Combined Performances for SBAS Receivers Using WAAS and EGNOS ; and Combined Performances for Open GPS/Galileo Receivers ) The EU Seventh Framework Programme on Research and Development ("FP7") has encouraged significant U.S. participation in European space research projects. In the third FP7 space call published in July 2009 U.S. participation increased with respect to previous calls. In total there were 20 U.S. participants in 15 proposals. Participants in these projects include Federal Agencies, namely NASA/Jet Propulsion Lab (CalTech), NASA/Goddard Space Flight Center, NOAA/Space Weather Prediction Center, Los Alamos Nat. Lab. and several leading U.S. universities. Two topics in the "Space Foundations" domain have particularly attracted U.S. participation: security of space assets from space weather events and security of space assets from in-orbits collisions.

### US and EU must cooperate for multilateral space cooperation

GMF 09 [The German Marshall Fund of the United States, “US-European Space Cooperation: Go Boldly, and Go Together”, GMF Blog Expert Commentary, 10/29/09, http://blog.gmfus.org/2009/10/us-european-space-cooperation-go-boldly-and-go-together/]

The current reviews of space policy in Europe and America offer an opportunity to advance human exploration as well as unmanned science missions. But to do so, President Obama and his European colleagues must chart a new route. Europe and the United States should together view space exploration not as the exclusive domain of scientists and government agencies, but of our entire societies. To engage the best of our societies in space exploration, we should return to that tested method of encouraging exploration, the prize. Most of NASA’s human exploration budget, and as much as Europe can contribute, should be pulled from government-run programs and put into a fund for major space exploration prizes. Money would be available within a few years for the United States and Europe to offer jointly prizes of, for example, 20 billion euros/$30 billion for a successful manned lunar mission and 50 billion euros/$75 billion for a successful Mars mission. NASA and the European Space Agency (ESA) would work on the common infrastructure that all prize-contenders would need, such as launch facilities and communications. But the energy, creativity, and risk-taking mindset that must all come together to advance exploration would come from American and European societies in partnership. Meanwhile, ESA and NASA would focus on the kind of high-risk, high-reward science that has succeeded in recent years, such as the Hubble and Spitzer space telescopes and the Mars landers.

Aviation Week 11 [Amy Svitak, 6/21/11, “Europe, U.S. Should Team In Space: Bolden”, http://www.aviationweek.com/aw/generic/story\_channel.jsp?channel=space&id=news/asd/2011/06/20/11.xml&headline=Europe,%20U.S.%20Should%20Team%20In%20Space:%20Bolden]

PARIS — As NASA puts the finishing touches on proposed hardware designs for a congressionally mandated space exploration program, the agency’s top official says U.S. companies should partner with European industry to develop it. “It is my hope that we’ll be able to have Europeans in the critical path somewhere in the exploration initiative,” NASA Administrator Charles Bolden said here during a tour of western Europe that includes the biennial Paris air show and a possible trip to the Vatican to meet Pope Benedict XVI. “If we don’t, then we’re not doing what I said we’re going to do, which is a new way of doing business where we do put people outside NASA in the critical path.” As NASA finalizes the design of a new heavy-lift rocket capable of sending humans beyond low Earth orbit — a shuttle-derived vehicle that is expected to incorporate two existing liquid-oxygen/liquid hydrogen stages and competitively selected liquid- or solid-fuel boosters (Aerospace DAILY, June 17) — Bolden says he hopes U.S. companies will team with European firms to develop the heavy-lift launcher. As an example, Bolden cites the collaborative proposal between Utah-based Alliant Techsystems (ATK) and Europe’s largest space company, the Astrium division of EADS, to jointly develop the Liberty rocket under NASA’s commercial crew transportation initiative. The agency rejected the U.S.-European proposal in April, but Bolden says he expects Liberty to compete in another round of awards anticipated next year as part of NASA’s plan to outsource astronaut and cargo transit to the International Space Station. “Look at what ATK did with Liberty, reaching out to [Astrium] to build an upper stage,” he says, citing the proposal’s use of the Vulcain engine that powers the core stage of Astrium’s Ariane 5 rocket. “That is an example of what you would hope American industry does.” Bolden says European firms also could compete for integration work under the heavy-lift launch vehicle program. “We haven’t talked about how we’re going to integrate the package,” he says. “That’s where I think you would find an opportunity for a European company if they wanted to enter the fray.” In addition to planned visits with Jean-Jacques Dordain, director general of the European Space Agency, as well as the heads of several European space bodies, Bolden says he will meet with European industry leaders. “This will be a listening meeting for me,” he says. “I just want to hear what they have in mind.”

# Japan CP 2AC

## **Generic Solvency**

### Japan is too preoccupied—Satellites to deter North Korea shot down

Taipei Times 03’ (Tue, Dec 02, 2003, Rocket flop a bad blow to Japanese space aims, http://www.taipeitimes.com/News/editorials/archives/2003/12/02/2003078077/2)

Japan's failed launch this weekend of a rocket carrying spy satellites has cast a shadow over its ambitions to lead Asia's space race, especially following China's successful manned space flight, experts said Sunday. The unsuccessful launch Saturday of two spy satellites to monitor North Korea also dealt a severe blow to Tokyo's space defense programme, meant as a response to Pyongyang's military threat, they said. A Japanese H-2A rocket with two spy satellites on board appeared to have lifted off smoothly from a launch site on the southern island of Tanegashima some 1,000km southwest of Tokyo. But the space center decided to destroy the rocket and the satellites about 10 minutes after take-off after one of the two rocket boosters failed to separate from the fuselage in the second phase of the flight. "With the failure, international trust in Japan's space technology has been damaged considerably," said Hideo Nagasu, former chief of Japan Aerospace Exploration Agency. "The failure is seen in sharp contrast to China's remarkable success," Nagasu said of Beijing's launch into orbit last month of a Chinese astronaut, who circled the Earth 14 times during a 21-hour flight. China, the world's newest space power, said last week it planned to send a spacecraft into orbit around the moon by 2007, while it is set to launch the first satellite in its "Double Star" project before the end of the year. Japan's failure came after five consecutive successful rocket launches, which followed two straight failures in 1998 and 1999. Experts forecast Japan will be forced to delay the planned launch of another H-2A rocket in February which was to carry a satellite to be used for weather observation. The failure also means a major setback in Japan's plans to set up a satellite defense scheme after the successful launch in March of its first spy satellites, analysts said. "It was a severe blow to its plan to begin satellite intelligence activities," said Hideshi Takesada, professor at the National Institute for defense Studies. "Operating only two satellites is insufficient as we need 16 satellites ideally," Takesada said. "And North Korea's missile threat remains unchanged. Japan really needs to rush to look into the failure, fully review the program and relaunch more satellites as quickly as possible."

### Japanese political atmosphere not ready for large policies

CSIS 10’

(Nicholas Szechenyi, deputy director of the Japan Chair at CSIS, where he is also a senior fellow. His research focuses on U.S.-Japan relations and U.S.–East Asia relations. Prio, JUN 2, 2010, Political Turmoil in Japan,http://csis.org/publication/political-turmoil-japan)

Last summer the DPJ secured a majority in the more powerful lower house of the Diet (parliament), which selects the prime minister, and the upper house election therefore does not necessitate a change in government. But Hatoyama’s poor performance introduces an element of uncertainty that could complicate the DPJ’s efforts to solidify control of the Diet. The DPJ had hoped to sustain momentum and establish a solid majority in the upper house poll to prevent gridlock and implement its legislative agenda without delay. However, recent polling suggests the DPJ has lost its lead over the LDP, and an increasing number of voters do not favor either party. This creates space for new small parties established by former LDP members that could become increasingly influential if the DPJ fares poorly and cannot secure a majority without forming a governing coalition. (Hatoyama formed a coalition with two other small parties, the People’s New Party and the Social Democratic Party, to secure the upper house majority, but the Social Democrats recently bolted the coalition to protest Hatoyama’s decision on the Okinawa base issue, and another run with the People’s New Party is unlikely.) The DPJ could squeak by but the upper house election could prove significant in determining the extent to which the DPJ can remain wedded to the policy prescriptions it advertised last year. Q4: What does Hatoyama’s resignation say about the state of Japanese domestic politics? A4: Some observers interpreted the DPJ victory last summer as the dawn of a new era of political leadership after decades of nearly uninterrupted rule by the LDP. Today’s developments render such pronouncements premature. The current situation is more likely a prelude to a new era, a messy process of political realignment featuring successive coalition governments as a new generation attempts to coalesce around a set of core principles that can underpin a sustainable majority. Hatoyama campaigned on a platform of “change,” but when one considers the instability that has plagued Japanese domestic politics in recent years, thus far it appears the more things change the more they stay the same.

### Japan is irresponsible with money

Bonner 11’ (Bill, written two New York Times best-selling books, attended the University of New Mexico and Georgetown Law School and began work with Jim Davidson, at the National Tax-payer's Union, received awards for renovating historic buildings along with his project manager Jean Hankey., March 16, 2011, Who will buy Japan's bonds?, http://www.csmonitor.com/Business/The-Daily-Reckoning/2011/0316/Who-will-buy-Japan-s-bonds/(page)/2)

The poor long-suffering beast has seen everything. The Japanese trusted the government with their retirement money. The government spent the money. And yet, bond buyers seem none the wiser. They still lend to the Japanese government at less than 2% yield. And now the old-timers are beginning to dis-save. That is, after saving so much for their retirements, now they are retired. And now they are drawing down their savings. This puts the Japanese government is in a real fix. Net savings in Japan are now negative. So, who will buy the bonds Japan needs to sell in order to rebuild its economy? Who will buy the bonds Japan needs to sell in order to rebuild its infrastructure? Who will buy the bonds Japan needs to sell in order to fund its government? Who will buy the bonds Japan needs to sell in order to pay back the people who bought bonds last year…and the year before…and all the way back to 1990? The answer is likely to be: no one. Instead, Japan will be forced into more QE, forced to print money to make up for the money she can no longer borrow. This will have a couple knock-on effects. First, the Japanese famously helped Europe and America finance their deficits and bailouts. Recently, Japan funded a major part of Europe’s bond sales – helping to hold down rates. Also, the last time we looked, Japan had the largest stash of US bonds in the world. Under pressure to bring money back to the home island, you can expect Japan to be doing some selling – which might be the final straw. Second, the Japanese are making such an obvious mess of their finances that they are bound to attract attention. Investors might notice that the Japanese aren’t the only ones. As we’ve pointed out several times, the developed economies all now count on low interest rates, huge deficits, and printing press money. Even with these massive in-puts of cash and credit grease, the economy still barely creaks forward. Without the extra grease, they will probably slip backward.

### Japan is still in recovery

EC 11’ (The Economic Collapse,10 April 2011, The Japanese Economy Is In Much Bigger Trouble Than Most People Think, http://theeconomiccollapseblog.com/archives/the-japanese-economy-is-in-much-bigger-trouble-than-most-people-think)

Now that nearly a month has gone by since the horrific tsunami in Japan on March 11th, it is starting to become clear just how much economic damage has been done. The truth is that the Japanese economy is in much bigger trouble than most people think. This is almost certainly going to be the most expensive disaster in Japanese history. The tsunami that struck Japan on March 11th swept up to 6 miles inland, destroying virtually everything in the way. Thousands upon thousands of Japanese were killed and entire cities were wiped off the map. Yes, Japan is a resilient nation, but exactly how does a nation that is already drowning in debt replace dozens of cities and towns that are suddenly gone? The truth is that thousands of square miles have been more completely destroyed than if they had been bombed by a foreign military force. The loss of homes, cars, businesses and personal wealth is almost unimaginable. It is going to take many years to rebuild the roads, bridges, rail systems, ports, power lines and water systems that were lost. Nobody is quite sure when the rolling blackouts are going to end, and nobody is quite sure when all of the damaged manufacturing facilities are going to be fully brought back online. On top of everything else, the nuclear crisis at Fukushima never seems to end. In fact, it seems to get worse with each passing day. According to the Los Angeles Times, it has now been announced that seawater off the coast of Japan near the Fukushima facility was recently found to contain 7.5 million times the legal limit of radioactive iodine.... The operator of Japan's stricken Fukushima nuclear plant said Tuesday that it had found radioactive iodine at 7.5 million times the legal limit in a seawater sample taken near the facility, and government officials imposed a new health limit for radioactivity in fish. Do you think anyone is going to want any Japanese seafood after this? In fact, at this point one must really question the long-term prospects for the seafood industry in that entire region of Asia. There are going to be tens of millions of people (myself included) that will no longer want anything to do with any seafood that comes from that part of the world. Sadly, some nuclear experts now claim that it could take years to bring the reactors at Fukushima fully back under control. At the end of this crisis, how large of an area around Fukushima will be uninhabitable? A 20 km radius? A 30 km radius? A 40 km radius? More? Japan is the third largest economy in the world, but it never was a large nation to begin with. Now that the tsunami and the nuclear crisis at Fukushima have made the amount of usable land significantly smaller, what is that going to mean for the future of the Japanese economy? That is a very good question. The truth is that there are already signs that the Japanese economy is regressing into another recession.

## US Key

### US is in a better financial situation

The Atlantic 11’ (DEREK THOMPSON, is senior editor at The Atlantic, and he oversees business coverage for TheAtlantic.com. He is a visiting research fellow at the Committee for a Responsible Federal Budget at the New America Foundation. <p> Derek has also written for Slate, BusinessWeek and The Daily Beast. He has appeared as a guest on radio and television networks, including NPR, the BBC, CNBC and MSNBC. MAR 14 2011 Is Japan's Debt Doomed? ,http://www.theatlantic.com/business/archive/2011/03/is-japans-debt-doomed/72450/)

Rebuilding northern Japan from the swath of devastation wrought by last week's quakes and tsunamis will cost the Japanese government tens of billions of dollars. Japan already has the world's highest debt to GDP ratio, at 200 percent -- more than three times the United States' burden. Washington is already concerned about the U.S. tip-toeing toward a debt crisis with far less red ink on our shoulders. What makes Japan so different? Even if the Yen weathers this storm, Japan can't expect to hold debt worth twice its GDP forever. High savings were sustainable when the population was younger, wealthy, and growing. Instead, Japan is old, stagnant and saving less every year. That investors have repeatedly failed to short Japanese debt since the early 1990s doesn't mean that Japanese debt is a good bet tomorrow. The country will eventually find itself in a financial catastrophe when the public stops lending money at floor-scraping 1.5 percent rates. Consider this alarming fact: If its interest rates doubled to 3 percent, interest payments would suddenly consume half of government revenue. This disaster will expand Japan's debt to GDP ratio by pulling on both ends. Debt will rise as Tokyo borrows $100 billion or so to rebuild, and GDP will shrink. As Time's Curious Capitalist explains, the disaster has caused factory shutdowns, from paper mills to beer breweries to chip foundries. Toyota has suspended all auto production through March 16, and "production disruptions in Japan could cause shortages of key components, especially in the consumer electronics industry, since the economy is a core part of the world's manufacturing supply network."

### U.S.’s technological experience coupled with the availability for new space programs makes them the best bet for successful lunar colonization

Reuters 7/20 (Irene Klotz, Jul 20, 2011, U.S. space shuttle spawned heart pump, fly by wire, http://www.reuters.com/article/2011/07/20/space-shuttle-achievements-idUSN1E76J0RM20110720)

NASA devoted 37 of its 135 shuttle missions to building and servicing the station. Now that it is complete, the shuttles are being retired to free up funds to develop new spaceships that can travel to the moon, asteroids, Mars and other destinations where shuttles cannot go. "The shuttle program to me was an evolutionary step off the planet and into the heavens. We have learned to live and work in low-Earth orbit," launch director Mike Leinbach said before Atlantis' July 8 liftoff. "I think we as a species need to be thinking about living off this planet, long-term. That ought to be the mission." NASA is counting on commercial providers to develop space taxis to fly astronauts to and from the space station, providing a backup to the Russian Soyuz spaceships that will cost the United States more than $50 million per seat to use. China, the only other country that has flown people in space, is not a part of the space station partnership. The government's retreat from the space transportation business opens opportunities for new industries, such as space tourism and private flights for research and education. "I think the shuttle will always be seen as a workhorse, but an expensive one," said commercial space advocate Peter Diamandis, founder of the $10 million Ansari X Prize competition for the first private manned suborbital space flight. "The shuttle gave the appearance of regular, easy access to space, but it was anything but that. It took the blood, sweat and tears of a talented army to keep it flying. Hopefully many lessons can be learned on how to create a safer and lower-cost system in the future," he said.

## Japanese Trade-off DA

### 1. Japanese economy showing signs of recovery

Maianichi Shimbun 7/8/11 (July 8, 2011, Japan's public finances at crossroad amid political fiasco, http://mdn.mainichi.jp/mdnnews/business/news/20110708p2g00m0bu090000c.html)

Four months after the devastating earthquake and tsunami in March, the Japanese economy shows some signs of recovery, but at the same time uncertainty is growing over its public finances as the government struggles to implement budgets and push through fiscal reforms amid political turmoil. Firing a rare warning shot, Finance Minister Yoshihiko Noda told reporters Tuesday that the government may run out of money as early as October, unless the Diet allows it to issue financing bonds by passing a bill that has been blocked by opposition parties, which control the House of Councillors. Without the passage of the bill, the government would be unable to execute some 40 percent of its 92.41 trillion yen initial budget for fiscal 2011 and could possibly cause inconvenience in people's everyday lives with public services scaled down or suspended. Noda wanted to ensure cooperation from the two major opposition parties, which had confirmed they would support the bill on condition that Prime Minister Naoto Kan would review his ruling party's main policies which they dub "pork-barrel spending," such as monthly child allowances and toll-free expressways. "As finance minister, I will make all-out efforts to win the Diet's approval" before the current session ends late August, Noda said.

### 2. JAXA can’t afford anymore space policies

Herrman 10’ (John, freelance writer based in New York City. He is also contributing editor at Gizmodo, graduate of the University of Edinburgh, He writes for SmartPlanet and is not an employee of CBS, December 20, 2010, 3:30 PM PST, Venus probe failure sobering for Japanese space program, http://www.smartplanet.com/blog/thinking-tech/venus-probe-failure-sobering-for-japanese-space-program/5749)

As far as entry barriers go, the spaceflight industry is about as unforgiving as it gets. Planetary missions can cost hundreds of millions of dollars, and in cases where they’re essentially retreading previous missions, the cost can be hard to justify. Venus in particular has been extensively studied and observed, and was even the target of the first successful interplanetary mission, the Mariner 2, which arrived in orbit of the planet 48 years before the Akatsuki was due to enter orbit, almost to the day. JAXA is known as a frugal organization, but costs for a mission like Akatsuki’s are still extremely high, especially when measured against the agency’s modest $4bn budget. It goes without saying that NASA’s interplanetary mission success rate is higher than 0%, but failures are far from rare. Missions to Mars in particular have proven fraught, with over half of probes sent to the Red Planet experiencing some degree of technical failure. The difference is that a failed unmanned mission to Mars doesn’t spark an existential crisis for NASA. An inquest, sure, and a bit of pushback from the press or Congress during budget negotiations, maybe. But it’s not a crisis. But for a smaller agency, a single failure represents the loss of a comparatively larger investment, and two failures could be enough to threaten an entire program. This may seem like an obvious observation, but the problems of scale and entry barriers have had a huge effect of the execution of space travel in general, and cut to the heart of the biggest issues facing private space flight. Even if the barriers have fallen in the last 50 years, the expensive and failure-prone early period of a modern space program is still prohibitively expensive for many would-be comers. If JAXA’s interplanetary efforts are threatened by two failures, just imagine the strain a series of mishaps could put on an even leaner, newer private entity like Virgin Galactic or SpaceX.

### 3. New spending would hurt the Japanese economy

Maianichi Shimbun 7/8/11 (July 8, 2011, Japan's public finances at crossroad amid political fiasco, http://mdn.mainichi.jp/mdnnews/business/news/20110708p2g00m0bu090000c.html)

Some **lawmakers**, both ruling and opposition, **are opposed to placing additional burdens on taxpayers before elections,** suggesting the Bank of Japan underwrite the state debt and supply ample funds, an unconventional method the central bank warns could trigger inflation without economic growth. No time can be wasted as for Japan's fiscal restoration, however. **Moody's and Standard & Poor's, the world's two biggest credit rating agencies, have threatened to downgrade their respective evaluations of Japanese government bonds, urging Tokyo to set up credible long-term rehabilitation goals despite rises in public spending after the disaster.** A lower rating could lead to higher borrowing costs. Under the current goals, the government seeks to achieve a primary balance surplus in fiscal 2020, which means the nation can finance all of its spending, except for debt-servicing costs, without issuing new debt, **after halving by fiscal 2015 the ratio of primary deficit to nominal gross domestic product. The government is due to review the goals later this year.**

### 4. Japanese economic collapse causes nuclear war.

Elliott, '2 (2-20, The Guardian)

Even so, the West cannot afford to be complacent about Japan. Action is needed, and quickly, because this is an economy that could soak up some of the world's excess capacity if it were functioning properly. A strong Japan is not only essential for the long-term health of the global economy, it is also needed as a counter-weight to the growing power of China. A collapse in the Japanese economy could, some experts believe, unleash a wave of extreme nationalism that would push the country into conflict with its bigger (and nuclear) neighbour.

## **Links**

### Any further delay in fiscal rebuilding of Japan could hurt Japanese economy

Reuters 7/20 (Stanley White, July 20, 2011,Japan yield spillover effect could exceed forecasts-IMF, http://www.reuters.com/article/2011/07/19/japan-economy-imf-idUST9E7HU00420110719)

A rise in yields and a decline in equities could force Japanese banks to shed riskier assets from their balance sheets as banks hold more than 40 percent of outstanding Japanese government debt, the IMF said, citing other member countries' analysis of Japan's economy . Under this scenario, the Bank of Japan would continue with its ultra-easy monetary policy for two more years by purchasing debt and other risk assets, but BOJ monetary policy would have hardly any impact on overseas markets and the yen, the IMF said. "The growth outlook for advanced economies is more fragile, suggesting that negative developments in Japan could have a substantially stronger effect on global growth," the IMF wrote in a report. This is the first year that the fund is conducting "spillover" analysis where Britain, China, the euro zone, Japan and the United States review each other's economic policies. Japanese financial markets tend not to trigger major shocks in foreign markets, because Japanese bond and equity markets are geared more toward domestic investors, the IMF report said. Still, some member countries were cautious about using historical data to model future market moves, because the links between different countries' sovereign risk have become stronger since the global financial crisis, the report said. The spillover report was part of the IMF's annual Article IV assessment of the economic outlook for member countries, which recommended last month that Japan raise its 5 percent sales tax to as much as 8 percent next year to pay for reconstruction after a magnitude 9.0 earthquake and nuclear meltdown in March. Any further delay in fiscal rebuilding could lead to a rise in yields, the IMF said. Japan's top banks could absorb a 300 basis point increase in Japanese government bond yields without falling below capital adequacy ratios, the report said. Any further rise would likely force Japanese banks to reduce foreign lending, the report said. The yield on 10-year Japanese government bonds traded at an eight-month low of 1.065 percent on Tuesday. Japan's outstanding public debt is twice the size of it $5 trillion economy. This is worse than Greece, which faces the risk of default. Still, Japanese yields are the lowest among developed countries, partly because foreign investors hold only 5 percent on Japanese government debt.

### Space budget cannot handle new spending

Suzuki 08’(Kazuto, Graduate School of Humanities and Social Sciences University of Tsukuba, 2 April 2008, Transforming Japan's Space Policy-making, http://www.tulips.tsukuba.ac.jp/dspace/bitstream/2241/97697/1/SP\_23-2.pdf)

If Japanese space policy-making process continues as it is today, the space community would be in jeopardy. Although Japanese economy is in recovery, space budget would unlikely increase under any circumstance because the huge government deficit and debt would not be resolved in foreseeable future. International competitiveness of space industry needs to be improved in order to sustain sufficient level of technological and industrial base. And most of all, the "exclusively peaceful purpose" resolution should be redefined in uncertain security condition around Japan. The world has changed from Cold War structure, and it is the time for Japan to transform its space policy

## **Impacts—Global Economy**

### Japanese economic disaster could threaten the global economy

EC 11’ (The Economic Collapse,10 April 2011, The Japanese Economy Is In Much Bigger Trouble Than Most People Think, http://theeconomiccollapseblog.com/archives/the-japanese-economy-is-in-much-bigger-trouble-than-most-people-think)

The truth is that this is a complete and total economic disaster. The Japanese economy is not going to be the same for many years to come. In fact, many are now warning that this could be one of the triggers that could lead to another major global financial crisis. One of the big fears is that Japan will need to sell off a large amount of U.S. Treasuries to fund the rebuilding of that nation. If that were to happen, it could result in a "liquidity crisis" similar to what we saw in 2008. Already the rest of the world is really starting to lose confidence in the U.S. dollar and in U.S. Treasuries, and if Japan starts massively dumping U.S. government debt things could get out of control fairly quickly. In any event, it is undeniable that the Japanese economy has been absolutely devastated by this crisis. In fact, when you combine the tsunami and the nuclear crisis, this could be the biggest economic disaster that any major industrial power has faced since World War 2. So will the crisis in Japan push the rest of the globe into another major recession? Only time will tell.

### Global economic crises cause war -- strong statistic support

Royal, '10 (Jedediah, Director of Cooperative Threat Reduction Program -- DOD, Economics of War & Peace: Legal and Political Perspectives, ed. Goldsmith & Brauer, p. 213-15)

Less intuitive is how periods of economic decline may increase the likelihood of external conflict. Political science literature has contributed a moderate degree of attention to the impact of economic decline and the security and defence behaviour of interdependent states. Research in this vein has been considered at systemic, dyadic and national levels. Several notable contributions follow. First, on the systemic level, Pollins (2008) advances Modelski and Thompson's (1996) work on leadership cycle theory, finding that rhythms in the global economy are associated with the rise and fall of a pre-eminent power and the often bloody transition from one pre-eminent leader to the next. As such, exogenous shocks such as economic crises could usher in a redistribution of relative power (see also Gilpin, 1981) that leads to uncertainty about power balances, increasing the risk of miscalculation (Fearon, 1995). Alternatively, even a relatively certain redistribution of power could lead to a permissive environment for conflict as a rising power may seek to challenge a declining power (Werner, 1999). Separately, Pollins (1996) also shows the global economic cycles combined with parallel leadership cycles impact the likelihood of conflict among major, medium and small powers, although he suggests that the causes and connections between global economic conditions and security conditions remain unknown. Second, on a dyadic level, Copeland's (1996, 2000) theory of trade expectations suggests that 'future expectation of trade' is a significant variable in understanding economic conditions and security behaviour of states. He argues that interdependent states are likely to gain pacific benefits from trade so long as they have an optimistic view of future trade relations. However, if the expectations of future trade decline, particularly for difficult to replace items such as energy resources, the likelihood for conflict increases, as states will be inclined to use force to gain access to those resources. Crises could potentially be the trigger for decreased trigger expectations either on its own or because it triggers protectionist moves by interdependent states.4 Third, others have considered the link between economic decline and external armed conflict at a national level. Blomberg and Hess (2002) find a strong correlation between internal conflict and external conflict, particularly during periods of economic downturn. They write, The linkages between internal and external conflict and prosperity are strong and mutually reinforcing. Economic conflict tends to spawn internal conflict, which in turn returns the favour. Moreover, the presence of a recession tends to amplify the extent to which international and external self-reinforce each other. (Blomberg & Hess, 2002, p. 89). Economic decline has also been linked with an increase in the likelihood of terrorism (Bloomberg, Hess, & Weerapana, 2004), which has the capacity to spill across borders and lead to external tensions. Furthermore, crises generally reduce the popularity of a sitting government. 'Diversionary theory' suggests that, when facing unpopularity arising from economic decline, sitting governments have increased incentives to fabricate external military conflicts to create a 'rally around the flag' effect. Wang (1996, DeRouen (1995), and Blomberg, Hess, and Thacker (2006) find supporting evidence showing that the tendency towards diversionary tactics are greater for democratic states than autocratic states, due to the fact that democratic leaders are generally more susceptible to being removed from office due to lack of domestic support. DeRouen (2000) has provided evidence showing that periods of weak economic performance in the United States, and thus weak Presidential popularity, are statistically linked to an increase in the use of force. In summary, recent economic scholarship positively correlates economic integration with an increase in the frequency of economic crises, whereas political scholarship links economic decline with external conflict at systemic, dyadic, and national levels.5 This implied connection between integration, crises and armed conflict has not featured prominently in the economic-security debate and deserves more attention. This observation is not contradictory to other perspectives that link economic interdependence with a decrease in the likelihood of external conflict, such as those mentioned in the first paragraph of this chapter. As such, the view presented here should be considered ancillary to those views.

## Impacts—US econ collapse

### U.S. relies on Japanese funding

LA Times 5-9 (SAM JAMESON, Times Staff Writer May 09, 1985, U.S. Relies on Japan Funds, Martin Says, http://articles.latimes.com/1985-05-09/business/fi-6940\_1\_interest-rates)

Preston Martin, vice chairman of the Federal Reserve Board, said Wednesday that an end to the flow of "tens of billions of dollars" in Japanese capital that finances American budget deficits would force higher interest rates in the United States. "It would put pressure on the Congress to take action so there wouldn't be so much of the budget to finance (with government bonds)," Martin told a group of reporters. "It would affect exchange rates and it would affect interest rates (in the United States). It might compel some action." Martin's statement amounted to an acknowledgment of recent Japanese claims that capital from Japan has become essential to restraining interest rates in the United States--a situation that has developed within the past year. No figures are available on what part of the U.S. budget deficit is being financed by Japanese capital, but some economists estimate that more than $60 billion in Japanese capital will flow into the United States in various forms of investment this year. In Japan's fiscal year 1984, more than $54.4 billion in long-term capital flowed out of Japan, most of it into U.S. Treasury bonds. In the previous fiscal year, only $20.8 billion in long-term capital was invested abroad. Martin declined to forecast how much Japanese capital will move into the United States this year, although he said it will amount to "tens of billions of dollars." He expressed no alarm at the growing American reliance on Japanese capital, but he pointed out that American banks "are doing a great deal more financing offshore than in the United States," and added, "That's just part of living in the world. . . . We can't retreat to a fortress America for our financing any more than we can for our goods and services." He said he did not want to contradict or support a call by Secretary of State George P. Shultz last month for Japan to use more of its savings at home. But he said that the use of "this marvelous Japanese resource of a high savings rate"--for more business investment, housing and infrastructure at home--"is one solution to the current (trade) problem." Still, he said that, if Japan followed Shultz' advice, a decline in or an end to the flow of Japanese capital into the United States would drive up American interest rates.

### US downturn kills its economic model – ensures mercantilism, collapse of multilateral cooperation which solves global problems, and the erosion of the international economic order.

Posen, '9 (Deputy Director & Senior Fellow -- IIE, clients.squareeye.com/uploads/foresight/documents/PN%20USA\_FINAL\_LR\_1.pdf)

In the postwar period, US power and prestige, beyond the nation’s military might, have been based largely on American relative economic size and success. These facts enabled the US to promote economic openness and buy-in to a set of economic institutions, formal and informal, that resulted in increasing international economic integration. With the exception of the immediate post-Bretton Woods oil-shock period (1974-85), this combination produced generally growing prosperity at home and abroad, and underpinned the idea that there were benefits to other countries of following the American model and playing by American rules. Initially this system was most influential and successful in those countries in tight military alliance with the US, such as Canada, West Germany, Japan, South Korea, and the United Kingdom. With the collapse of Soviet communism in 1989, and the concomitant switch of important emerging economies, notably Brazil, China, India, and Mexico, to increasingly free-market capitalism, global integration on American terms through American leadership has been increasingly dominant for the last two decades. The global financial crisis of 2008-09, however, represents a challenge to that world order. While overt financial panic has been averted, and most economic forecasts are for recovery to begin in the US and the major emerging markets well before end of 2009 (a belief I share), there remain significant risks for the US and its leadership. The global financial system, including but not limited to US-based entities, has not yet been sustainably reformed. In fact, financial stability will come under strain again when the current government financial guarantees and public ownership of financial firms and assets are unwound over the next couple of years. The growth rate of the US economy and the ability of the US government to finance responses to future crises, both military and economic, will be meaningfully curtailed for several years to come. Furthermore, the crisis will accelerate at least temporarily two related long-term trends eroding the viability of the current international economic arrangements. First, perhaps inevitably, the economic size and importance of China, India, Brazil, and other emerging markets (including oil-exporters like Russia) has been catching up with the US, and even more so with demographically and productivity challenged Europe and northeast Asia. Second, pressure has been building over the past fifteen years or so of these developing countries’ economic rise to give their governments more voice and weight in international economic decision-making. Again, this implies a transfer of relative voting share from the US, but an even greater one from overrepresented Western Europe. The near certainty that Brazil, China, and India, are to be less harmed in real economic terms by the current crisis than either the US or most other advanced economies will only emphasise their growing strength, and their ability to claim a role in leadership. The need for capital transfers from China and oil-exporters to fund deficits and bank recapitalisation throughout the West, not just in the US, increases these rising countries’ leverage and legitimacy in international economic discussions.One aspect of this particular crisis is that American economic policymakers, both Democratic and Republican, became increasingly infatuated with financial services and innovation beginning in the mid-1990s. This reflected a number of factors, some ideological, some institutional, and some interest group driven. The key point here is that export of financial services and promotion of financial liberalisation on the US securitised model abroad came to dominate the US international economic policy agenda, and thus that of the IMF, the OECD, and the G8 as well. This came to be embodied by American multinational commercial and investment banks, in perception and in practice. That particular version of the American economic model has been widely discredited, because of the crisis’ apparent origins in US lax regulation and over-consumption, as well as in excessive faith in American-style financial markets. Thus, American global economic leadership has been eroded over the long-term by the rise of major emerging market economies, disrupted in the shortterm by the nature and scope of the financial crisis, and partially discredited by the excessive reliance upon and overselling of US-led financial capitalism. This crisis therefore presents the possibility of the US model for economic development being displaced, not only deservedly tarnished, and the US having limited resources in the near-term to try to respond to that challenge. Additionally, the US’ traditional allies and co-capitalists in Western Europe and Northeast Asia have been at least as damaged economically by the crisis (though less damaged reputationally). Is there an alternative economic model? The preceding description would seem to confirm the rise of the Rest over the West. That would be premature. The empirical record is that economic recovery from financial crises, while painful, is doable even by the poorest countries, and in advanced countries rarely leads to significant political dislocation. Even large fiscal debt burdens can be reined in over a few years where political will and institutions allow, and the US has historically fit in that category. A few years of slower growth will be costly, but also may put the US back on a sustainable growth path in terms of savings versus consumption. Though the relative rise of the major emerging markets will be accelerated by the crisis, that acceleration will be insufficient to rapidly close the gap with the US in size, let alone in technology and well-being. None of those countries, except perhaps for China, can think in terms of rivaling the US in all the aspects of national power. These would include: a large, dynamic and open economy; favorable demographic dynamics; monetary stability and a currency with a global role; an ability to project hard power abroad; and an attractive economic model to export for wide emulation. This last point is key. In the area of alternative economic models, one cannot beat something with nothing – communism fell not just because of its internal contradictions, or the costly military build-up, but because capitalism presented a clearly superior alternative. The Chinese model is in part the American capitalist (albeit not high church financial liberalisation) model, and is in part mercantilism. There has been concern that some developing or small countries could take the lesson from China that building up lots of hard currency reserves through undervaluation and export orientation is smart. That would erode globalisation, and lead to greater conflict with and criticism of the US-led system. While in the abstract that is a concern, most emerging markets – and notably Brazil, India, Mexico, South Africa, and South Korea – are not pursuing that extreme line. The recent victory of the incumbent Congress Party in India is one indication, and the statements about openness of Brazilian President Lula is another. Mexico’s continued orientation towards NAFTA while seeking other investment flows (outside petroleum sector, admittedly) to and from abroad is a particularly brave example. Germany’s and Japan’s obvious crisis-prompted difficulties emerging from their very high export dependence, despite their being wealthy, serve as cautionary examples on the other side. So unlike in the1970s, the last time that the US economic performance and leadership were seriously compromised, we will not see leading developing economies like Brazil and India going down the import substitution or other self-destructive and uncooperative paths. If this assessment is correct, the policy challenge is to deal with relative US economic decline, but not outright hostility to the US model or displacement of the current international economic system. That is reassuring, for it leaves us in the realm of normal economic diplomacy, perhaps to be pursued more multilaterally and less high-handedly than the US has done over the past 20 years. It also suggests that adjustment of current international economic institutions is all that is required, rather than desperately defending economic globalisation itself. For all of that reassurance, however, the need to get buy-in from the rising new players to the current system is more pressing on the economic front than it ever has been before. Due to the crisis, the ability of the US and the other advanced industrial democracies to put up money and markets for rewards and side-payments to those new players is also more limited than it has been in the past, and will remain so for at least the next few years. The need for the US to avoid excessive domestic self-absorption is a real concern as well, given the combination of foreign policy fatigue from the Bush foreign policy agenda and economic insecurity from the financial crisis. Managing the post-crisis global economy Thus, the US faces a challenging but not truly threatening global economic situation as a result of the crisis and longer-term financial trends. Failure to act affirmatively to manage the situation, however, bears two significant and related risks: first, that China and perhaps some other rising economic powers will opportunistically divert countries in US-oriented integrated relationships to their economic sphere(s); second, that a leadership vacuum will arise in international financial affairs and in multilateral trade efforts, which will over time erode support for a globally integrated economy. Both of these risks if realised would diminish US foreign policy influence, make the economic system less resilient in response to future shocks (to every country’s detriment), reduce economic growth and thus the rate of reduction in global poverty, and conflict with other foreign policy goals like controlling climate change or managing migration and demographic shifts. If the US is to rise to the challenge, it should concentrate on the following priority measures

### Causes economic nationalism globally – Causes World War and accesses every hotspot.

Garten, '9 (Yale School of Management Professor, WSJ)

Yet if historians look back on today's severe downturn, with its crumbling markets, rising unemployment and massive government interventions, they could well be busy analyzing how globalization -- the spread of trade, finance, technology and the movement of people around the world -- went into reverse. They would likely point to the growth of economic nationalism as the root cause. Ordinary protectionism such as tariffs and quotas would be one aspect of this problem, but it won't be the worst of it because a web of treaties and the enforcement capabilities of the World Trade Organization will constrain the most egregious behavior. Economic nationalism is more insidious because it is broader, more subtle and subject to fewer legal constraints. It is a frame of mind that casts doubt on the very assumption that we live in a single international market, and that relatively open borders are a virtue. It is based on a calculation that despite all the talk about economic interdependence, nations can go it alone, and could be better off in doing so. True economic nationalists want above all to protect capital and jobs in their own countries. They see global commerce not as a win-win proposition but as a contest in which there is a victor and a loser. They are thus not focused on international agreements to open the world economy; to the contrary, they are usually figuring out how to avoid international commercial obligations. The last time we saw sustained economic nationalism was in the 1930s, when capital flows and trade among countries collapsed, and every country went its own way. World growth went into a ditch, political ties among nations deteriorated, nationalism and populism combined to create fascist governments in Europe and Asia, and a world war took place. It took at least a generation for globalization to get back on track. There have been some bouts of inwardlooking governmental action since then, such as the early 1970s when the U.S. cut the dollar from its gold base and imposed export embargoes on soybeans and steel scrap. However, the economic conditions were not sufficiently bad for the trend to sustain itself. The kind of economic nationalism we are seeing today is not yet extreme. It is also understandable. The political pressures could hardly be worse. Over the last decade, the global economy grew on average about 4% to 5%, and this year it will come to a grinding halt: 0.5% according to the International Monetary Fund, where projections usually err on the optimistic side. World trade, which has grown much faster than global gross domestic product for many years, is projected to decline this year for the first time since 1982. Foreign direct investment last year slumped by 10% from 2007. Most dramatically, capital flows into emerging market nations are projected to drop this year by nearly 80% compared to 2007. The aggregate figures don't tell the story of what is unraveling in individual countries. In the last quarter of 2008, U.S. GDP dropped by 6.2% at an annual rate, the U.K. by 5.9%, Germany by 8.2%, Japan by 12.7% and South Korea by 20.8%. Mexico, Thailand and Singapore and most of Eastern Europe are also in deep trouble. In every case, employment has been plummeting. So far popular demonstrations against government policies have taken place in the U.K., France, Greece, Russia and throughout Eastern Europe. And the governments of Iceland and Latvia have fallen over the crisis. Governments could therefore be forgiven if they are preoccupied above all with the workers and companies within their own borders. Most officials don't know what to do because they haven't seen this level of distress before. They are living from day to day, desperately improvising and trying to hold off political pressure to take severe measures they know could be satisfying right now but cause bigger damage later. Thinking about how their policies might affect other countries is not their main focus, let alone taking the time to try to coordinate them internationally. Besides, whether it's in Washington, Brussels, Paris, Beijing, Brazilia or Tokyo, it is hard to find many top officials who wouldn't say that whatever measures they are taking that may undermine global commerce are strictly temporary. They all profess that when the crisis is over, they will resume their support for globalization. They underestimate, however, how hard it could be to reverse course. Political figures take comfort, too, from the global institutions that were not present in the 1930s -- the IMF, the World Bank and the World Trade Organization, all of which are assumed to be keeping globalization alive. This is a false sense of security, since these institutions are guided by sovereign countries. Government officials often feel that because they are going to endless crisis summit meetings -- the next big one is in London on April 2, when the world's top 20 nations will be assembling -- that some international coordination is actually taking place. This is mostly an Then there is the currency issue. Economic nationalists are mercantilists. They are willing to keep their currency cheap in order to make their exports more competitive. China is doing just that. A big question is whether other Asian exporters that have been badly hurt from the crisis -- Taiwan, South Korea and Thailand, for example -- will follow suit. Competitive devaluations were a major feature of the 1930s. It's no accident that the European Union has called an emergency summit for this Sunday to consider what to do with rising protectionism of all kinds. There are a number of reasons why economic nationalism could escalate. The recession could last well beyond this year. It is also worrisome that the forces of economic nationalism were gathering even before the crisis hit, and have deeper roots than most people know. Congress denied President Bush authority to negotiate trade agreements two years ago, fearing that America was not benefiting enough from open trade, and an effort to reform immigration was paralyzed for years. Globally, international trade negotiations called the Doha Round collapsed well before Bear Stearns and Lehman Brothers did. Concerns that trade was worsening income distribution were growing in every major industrial nation since the late 1990s. Whenever countries turned inward over the past half-century, Washington was a powerful countervailing force, preaching the gospel of globalization and open markets for goods, services and capital. As the Obama administration works feverishly to fire up America's growth engines, patch up its financial system and keep its housing market from collapsing further, and as its major long-term objectives center on health, education and reducing energy dependence on foreign sources, the country's preoccupations are more purely domestic than at any time since the 1930s. In the past, American business leaders from companies such as IBM, GE, Goldman Sachs and, yes, Citigroup and Merrill Lynch beat the drum for open global markets. As their share prices collapse, some voices are muted, some silenced. It is not easy to find anyone in America who has the stature and courage to press for a more open global economy in the midst of the current economic and political crosswinds. And given that the global rot started in the U.S. with egregiously irresponsible lending, borrowing and regulation, America's brand of capitalism is in serious disrepute around the world. Even if President Obama had the mental bandwidth to become a cheerleader for globalization, America's do-as-I-say-and-not-as-I-do leadership has been badly compromised. If economic nationalism puts a monkey wrench in the wheels of global commerce, the damage could be severe. The U.S. is a good example. It is inconceivable that Uncle Sam could mount a serious recovery without a massive expansion of exports -- the very activity that was responsible for so much of America's economic growth during the middle of this decade. But that won't be possible if other nations block imports. For generations, the deficits that we have run this past decade and the trillions of dollars we are spending now mean we will be highly dependent on foreign loans from China, Japan and other parts of the world. But these will not be forthcoming at prices we can afford without a global financial system built on deep collaboration between debtors and creditors -- including keeping our market open to foreign goods and services. The Obama administration talks about a super-competitive economy, based on high-quality jobs -- which means knowledge-intensive jobs. This won't happen if we are not able to continue to bring in the brightest people from all over the world to work and live here. Silicon Valley, to take one example, would be a pale shadow of itself without Indian, Chinese and Israeli brain power in its midst. More generally, without an open global economy, worldwide industries such as autos, steel, banking and telecommunications cannot be rationalized and restructured efficiently, and we'll be doomed to have excessive capacity and booms and busts forever. The big emerging markets such as China, India, Brazil, Turkey and South Africa will never be fully integrated into the world economy, depriving them and us of future economic growth. The productivity of billions of men and women entering the global workforce will be stunted to everyone's detriment. Of course, no one would say that globalization is without its problems. Trade surges and products made by low-priced labor can lead to job displacement and increasing income inequality. Proud national cultures can be undermined. But these challenges can be met by reasonable regulation and by domestic policies that provide a strong social safety net and the kind of education that helps people acquire new skills for a competitive world. With the right responses of governments, the benefits should far outweigh the disadvantages. For thousands of years, globalization has increased global wealth, individual choice and human freedom. The point is, economic nationalism, with its implicit autarchic and save-yourself character, embodies exactly the wrong spirit and runs in precisely the wrong direction from the global system that will be necessary to create the future we all want. As happened in the 1930s, economic nationalism is also sure to poison geopolitics. Governments under economic pressure have far fewer resources to take care of their citizens and to deal with rising anger and social tensions. Whether or not they are democracies, their tenure can be threatened by popular resentment. The temptation for governments to whip up enthusiasm for something that distracts citizens from their economic woes -- a war or a jihad against unpopular minorities, for example -- is great. That's not all. As an economically enfeebled South Korea withdraws foreign aid from North Korea, could we see an even more irrational activity from Pyongyang? As the Pakistani economy goes into the tank, will the government be more likely to compromise with terrorists to alleviate at least one source of pressure? As Ukraine strains under the weight of an IMF bailout, is a civil war with Cold War overtones between Europe and Russia be in the cards? And beyond all that, how will economically embattled and inward-looking governments be able to deal with the critical issues that need global resolution such as control of nuclear weapons, or a treaty to manage climate change, or help to the hundreds of millions of people who are now falling back into poverty?

### Causes great power nuclear war.

Michael Panzner, Prof. at the New York Institute of Finance, 25-year veteran of the global stock, bond, and currency markets who has worked in New York and London for HSBC, Soros Funds, ABN Amro, Dresdner Bank, and JPMorgan Chase, 2009, Financial Armageddon: Protect Your Future from Economic Collapse, p. 136-138

The rise in isolationism and protectionism will bring about ever more heated arguments and dangerous confrontations over shared sources of oil, gas, and other key commodities as well as factors of production that must, out of necessity, be acquired from less-than-friendly nations. Whether involving raw materials used in strategic industries or basic necessities such as food, water, and energy, efforts to secure adequate supplies will take increasing precedence in a world where demand seems constantly out of kilter with supply. Disputes over the misuse, overuse, and pollution of the environment and natural resources will become more commonplace. Around the world, such tensions will give rise to full-scale military encounters, often with minimal provocation. In some instances, economic conditions will serve as a convenient pretext for conflicts that stem from cultural and religious differences. Alternatively, nations may look to divert attention away from domestic problems by channeling frustration and populist sentiment toward other countries and cultures. Enabled by cheap technology and the waning threat of American retribution, terrorist groups will likely boost the frequency and scale of their horrifying attacks, bringing the threat of random violence to a whole new level. Turbulent conditions will encourage aggressive saber rattling and interdictions by rogue nations running amok. Age-old clashes will also take on a new, more heated sense of urgency. China will likely assume an increasingly belligerent posture toward Taiwan, while Iran may embark on overt colonization of its neighbors in the Mideast. Israel, for its part, may look to draw a dwindling list of allies from around the world into a growing number of conflicts. Some observers, like John Mearsheimer, a political scientist at the University of Chicago, have even speculated that an “intense confrontation” between the United States and China is “inevitable” at some point. More than a few disputes will turn out to be almost wholly ideological. Growing cultural and religious differences will be transformed from wars of words to battles soaked in blood. Long-simmering resentments could also degenerate quickly, spurring the basest of human instincts and triggering genocidal acts. Terrorists employing biological or nuclear weapons will vie with conventional forces using jets, cruise missiles, and bunker-busting bombs to cause widespread destruction. Many will interpret stepped-up conflicts between Muslims and Western societies as the beginnings of a new world war.

# Privatization CP 2AC

### Lacking full government support for privatization of NASA. Discover Magazine, 10 (“Obama’s NASA Budget: So Long, Moon Missions; Hello, Private Spaceflight”, February 1st, 2010, Access Date\_7/18/11).

However, the White House’s plan to shift to private spaceflight has already ruffled plenty of feathers. Congressional representatives from states with many NASA jobs, like Florida and Texas, have promised to fight the move all the way. Michael Griffin, the previous NASA administrator who served under President George W. Bush, was even more bitter at seeing Obama cut his prized program: “It means that essentially the U.S. has decided that they’re not going to be a significant player in human space flight for the foreseeable future… One day it will be like commercial airline travel, just not yet. It’s like 1920. Lindbergh hasn’t flown the Atlantic, and they’re trying to sell 747s to Pan Am”

### Privatization of Space- expensive for taxpayers. Gagnon, 03 (Bruce, “SPACE PRIVATIZATION: ROAD TO CONFLICT?”, coordinator of the Global Network Against Weapons & Nuclear Power in Space, June 21st, 2003, Access Date\_7/17/11).

Plans are now underway to make space the next "conflict zone" where corporations intend to control resources and maximize profit. The so-called private "space pioneers" are the first step in this new direction. And ultimately the taxpayers will be asked to pay the enormous cost incurred by creating a military space infrastructure that would control the "shipping lanes" on and off the planet Earth. After Columbus returned to Spain with the news that he had discovered the "new world," Queen Isabella began the 100 year process to create the Spanish Armada to protect the new "interests and investments" around the world. This helped create the global war system. Privatization does not mean that the taxpayer won't be paying any more. Privatization really means that profits will be privatized. Privatization also means that existing international space legal structures will be destroyed in order to bend the law toward private profit. Serious moral and ethical questions must be raised before another new "frontier" of conflict is created.

### Privatization of space costs crushes US industry jobs. Powell, 10 (Stewart, “Obama, NASA at crossroads over privatization of space travel”, Houston Chronicle, August 2nd, 2010, Access Date\_7/17/11).

Obama's proposed shift away from U.S. government spacecraft to reach orbit poses long-term challenges for Houston's Johnson Space Center, a facility that has served as mission control for every manned mission aboard U.S. government spacecraft since the early days of space exploration. Impending retirement of the shuttle fleet alone has already prompted United Space Alliance, a major NASA contractor, to announce layoffs of 1,400 employees in Texas, Florida and Alabama who prepare shuttles for re-launch. NASA has contracted with Russia to carry U.S. astronauts and cargo to the space station until the United States deploys a crew-rated commercial spacecraft or a U.S. government successor to the shuttle, probably around 2015. Added to that, Obama wants Congress to partly finance commercial delivery of astronauts and cargo supplies to the space station by killing the $108 billion Constellation program to return astronauts to the moon by 2020 aboard a U.S. government spacecraft — a program that accounts for an estimated 7,000 jobs at Johnson Space Center and among related contractors.

### Critics say NASA is the only agency who can properly maintain the industry. Chang, 10 (Kenneth, “Obama Plan Privatizes Astronaut Launchings”, science reporter for the New York Times, covering chemistry, geology, solid state physics, nanotechnology, January 28th, 2010, Access Date\_7/18/11).

Skeptics wonder whether the commercial approach would be significantly faster or cheaper than completing the Ares I and the Orion capsule that would carry the astronauts, and how astronaut safety would be maintained. NASA has spent about $9 billion on Ares I and Orion. “We have already spent valuable time and billions of dollars developing this program,” Representative Michael McCaul, Republican of Texas, said in an e-mail statement. “It makes no sense to throw away a plan backed by 50 years of NASA experience and institutional knowledge in favor of start-up operations, which may encounter delays and unknown obstacles.”

### Experts say NASA is more capable to carry out policy opposed to the private sector. Chang, 10 (Kenneth, “Obama Plan Privatizes Astronaut Launchings”, science reporter for the New York Times, covering chemistry, geology, solid state physics, nanotechnology, January 28th, 2010, Access Date\_7/18/11).

The retirement of the space shuttles will cost at least 4,600 of the 15,000 jobs at the Kennedy Space Center. The administration official said the commercial launching initiative could create up to 1,700 jobs in Florida, but that figure is based on projections of the Commercial Spaceflight Federation, a trade group. Sally K. Ride, a former astronaut who served on the blue-ribbon panel, said she was encouraged by the budget increase for NASA in light of the planned freeze on domestic spending over all. “They plan to be sending people beyond low-Earth orbit, and they have a good formulation,” Dr. Ride said. “I think the way to evaluate this plan when it’s rolled out is to ask whether the administration has given NASA the funds for what it’s asked to do.” “It appears to me the answer is yes,” Dr. Ride said, based on briefings she had received on the plans. She said the administration took options the panel presented and “came up with an innovative approach for NASA.”

However, many in NASA's old guard oppose the plan. Charles Precourt, a former chief of NASA's astronaut corps who is now a senior executive at aerospace and defense firm Alliant Techsystems Inc., said that farming out large portions of the manned space program to private firms would be a "really radical" and an "extremely high risk" path. Unless the overall budget goes up, he said, whatever new direction NASA pursues "isn't going to be viable." Such arguments already are raging around NASA's Ares I rocket, which could be replaced or scaled back if the commercial option gains traction. Some Ares I contract work could be shifted toward providing the basic elements of a future larger, more-powerful NASA family of rockets. Alliant and other Ares proponents have argued the program is several years behind schedule primarily because Congress and previous administrations failed to provide promised funding. According to some of these analyses, Congress in the past five years earmarked a total of about $4 billion less than initially projected for NASA's manned exploration programs. The design of the Ares I also changed and became more complex since its inception.

### Privatization- NASA can still achieve goals despite budget cuts. Paur, 09 (Jason, “Let Private Sector Help NASA”, FAA Experiments With Integrating Drones in Civil Airspace, August 20th, 2009, Access Date\_7/19/11).

NASA is bullish on commercial space ventures. NASA Administrator Charles Bolden and his deputy, Lori Garver, support such ventures, and the tight budget has them seeking new ways to meet the agency’s goals, Jim Muncy, president of the PoliSpace consulting firm and co-founder of the Space Frontier Foundation, told Space.com in an excellent story on the issue. But NASA contractor and aerospace giant Lockheed Martin says there’s too much risk associated with commercial space flight to make that a viable alternative to a government program.

### Concerns that privatization is promising too much. Paur, 09 (Jason, “Let Private Sector Help NASA”, FAA Experiments With Integrating Drones in Civil Airspace, August 20th, 2009, Access Date\_7/19/11).

Stevens is obviously referring to Elon Musk and his SpaceX venture. It is one of several firms trying to develop a delivery system to send people and cargo into space. Falcon 1 (shown above), made its first successful flight 11 months ago. In December, SpaceX won a $1.6 billion Commercial Resupply Services contract to resupply the International Space Station. The company plans to demonstrate its docking capability next year. Stevens said it is important to wait and see if SpaceX can successfully deliver cargo before talking about delivering humans. “We’re concerned these entrepreneurial firms are promising too much. If you don’t know what you don’t know, then it’s easy to say you can do this for so much,” Stevens said.

### Privatizing- disputes between the president and congress. Navarro, 10 (Peter, “Peter Navarro: Privatization in space wise, to a point”, a Professor of Economics and Public Policy at the Paul Merage School of Business, University of California, Irvine and holds a Ph.D. in Economics from Harvard University, May 17th, 2010, Access Date\_7/19/11).

Now that President Barack Obama has unveiled his plans for our stale space agency, we fear the only way is down, not up. The problem lies in this seeming paradox: A left-leaning president is pushing space privatization while opposed by conservatives in Congress fighting to protect what has become an overpriced jobs program.Privatizing space- hinder America’s future space achievement. Wu, 10 (David, “Debate: Obama's Space Privatization Plan Is a Costly Mistake”, chairman of the House Science and Technology Subcommittee on Technology and Innovation, April 15th, 2010, Access Date\_7/19/11).

The space program encourages us to reach for the stars in both our dreams and our actions. It helps drive innovation, and it challenges us to find creative solutions to technological challenges. Moreover, it inspires America's next generation of scientists and engineers to pursue their passions -- something we must have if our nation is to compete in the 21st century global economy. The president's plan to privatize our spaceflight program will hinder our nation's ability to remain at the forefront of human achievement for generations to come. We must reconsider.

### After privatizing space, lack of clear goals for space program. Wu, 10 (David, “Debate: Obama's Space Privatization Plan Is a Costly Mistake”, chairman of the House Science and Technology Subcommittee on Technology and Innovation, April 15th, 2010, Access Date\_7/19/11).

The president's plan to privatize space exploration rests on ill-defined objectives and unsubstantiated assumptions. For instance, the administration has not adequately explained where the space program's shifted trajectory will lead our nation and cannot explain how its plan affects our nation's previously established goals of returning humans to the moon by 2020 and some day sending astronauts to Mars and beyond. Without clearly defined goals, including specific destinations and timelines for reaching them, how can we ensure that taxpayers are receiving an adequate return on their investments in space exploration? It is simply unwise to carry out such a dramatic shift in how our nation conducts space exploration without a clear objective in mind.

### Privatization won’t get us to the moon. Verhovek, 09 (Sam Howe, “In 2010, The Civilization Space Industry Finally Takes Off”, Science and Technology Columnist for the LA Times and the New York Times, December 6th, 2009, Access Date\_7/19/11).

Private industry will not take us to the moon, a point on which industry executives are nearly unanimous. What it can do is handle comparatively short-range tasks while NASA focuses on the farther reaches of space. “The rationale here is that NASA needs to do the hard stuff and leave the simpler stuff—granted, human spaceflight is not an easy thing, but it is something we’ve been doing for 50 years—if it wants to go beyond,” says Bretton Alexander, president of the Commercial Spaceflight Federation, a Washington, D.C.–based industry group. “NASA can actually focus on doing the cool stuff”—Mars, asteroids and elsewhere—“and over the long term, you have an industry that is not only focused on NASA. NASA becomes a user, not the sole provider.”

# Politics 2AC

## Plan Popular – Space Exploration (generic)

### Congressmen worried that cuts in space exploration would threaten heg, security, economy

Derby 6/28 [Kevin – reporter for the Sunshine State News. “Florida’s Congressional Delegation Takes Bipartisan Stand Against Obama Cuts to Nasa”. June 28, 2011. http://www.sunshinestatenews.com/story/floridas-congressional-delegation-takes-bipartisan-stand-against-obama-cuts-nasa ayc]

With President Barack Obama threatening to slash NASA’s budget, members of Florida’s delegation from both parties continued to speak out last week, warning the White House that these cuts would have a severe impact on the state and the nation. On Tuesday, 62 members of Congress -- including 13 of Florida’s 25 representatives in the U.S. House -- sent a letter to Obama urging the administration to back down from the proposed cuts. Florida Democrats in the House who signed the letter were Corrine Brown, Alan Grayson, Ron Klein, Suzanne Kosmas and Debbie Wasserman Schultz. Republicans representing the Sunshine State in Congress who signed were Ander Crenshaw, Lincoln Diaz-Balart, Mario Diaz-Balart, Jeff Miller, Bill Posey, Adam Putnam, Tom Rooney and C.W. Bill Young. “Human space exploration is ingrained in the American psyche,” wrote the congressmen. “It is part of who we are as explorers, entrepreneurs, scientists and Americans. The proposed Exploration Systems Mission Directorate reduction jeopardizes our country's leadership in space and could put our national security at risk.” The congressmen warned that other nations could catch up to America on space exploration due to the proposed budget cuts. “If we continue with this new space policy, including the outright cancellation of the Constellation program, we are concerned that other countries will forge ahead of us, challenging our space dominance as we literally cede the higher ground to our foreign competitors,” wrote the congressmen. The congressmen also urged the president to back more ambitious space missions. “A robust American deep-space exploration program would ensure that American astronauts explore beyond low-Earth orbit to the Moon, Mars or any number of exciting deep-space destinations,” wrote the congressmen. “Additionally, a renewed focus on heavy-lift vehicles and exploration will inspire our youth, invigorate our work force and protect many jobs in today's difficult economy.” The bipartisanship on the issue is nothing new. U.S. Rep. Suzanne Kosmas, a Democrat from the Space Coast, penned editorials with Republican Sen. Kay Bailey Hutchinson from Texas, urging the president to rescind the cuts. U.S. Rep. Ander Crenshaw, the former state Senate president who has represented Northern Florida in Congress since being elected in 2000, expressed additional concern on Friday over what Obama’s cuts to NASA could mean to the nation and to the state. “The administration’s plan to eliminate funding for NASA’s Constellation program amounts to short-sighted policy that abdicates America’s responsibility to human space flight and gives competing countries a wider opening to forge ahead where the United States has always led,” said Crenshaw. “Simultaneously, funding cuts will hurt ongoing research and development of supporting technological projects such as a heavy-lift launch vehicle which could be used for other NASA missions.” Crenshaw stressed that the cuts would have a severe impact in the Sunshine State. “In Florida, an irreplaceable and highly-skilled work force plays an integral role in the development of NASA initiatives,” said Crenshaw. “There is no reason to lose them -- a move that will damage our industrial base – when so much is at stake in the future of manned space exploration.”

### Bipartisan - Space unites Democrats and Republicans

Morring 4/4 [Frank - Deputy managing editor/space at Aviation Week. “Bipartisan Bellwether”. Aviation Week & Space Technology, Vol. 173, Issue 12, 4/4/2011. EBSCO ayc]

House Joins Senate In Rancor Over NASA Heavy-Lifter Laggard start to NASA heavy-lift launch vehicleriles both parties in both houses of Congress Frustration with NASA at the slow start of work on a new heavy-lift launch vehicle ordered in last year's three-year authorization act for the agency has united Democrats and Republicans who are otherwise at loggerheads over future federal spending. Engineers reviewing options for the heavy-lift Space Launch System (SLS) that would replace the canceled Ares V will make their final selection no sooner than "late June"--a slip from as early as "late spring"--and NASA has cut the amount already authorized for the work in Fiscal 2012 by $850 million in its budget request for that year. "The debate is over," says Rep. Ralph Hall (R-Texas), chairman of the House Science, Space and Technology Committee. "This act is the law. NASA has its direction. The administration needs to acknowledge this and act accordingly."

### Obama and the congress are onboard space missions – only budget cuts block space programs

Wilford 7/8 [John Noble – writer for the New York Times. “3, 2, 1, and the Last Shuttle Leaves an Era Behind”. http://www.nytimes.com/2011/07/09/science/space/09wilford.html ayc]

Foreseeing the end of shuttle flights, the Obama administration and NASA last year proposed new plans, approved by Congress, to develop heavy-lift rockets for sending people deeper into space, to be ready perhaps after 2020. Meanwhile, NASA has begun financing research for intermediate crew-only spacecraft to be produced and launched by commercial companies, probably no sooner than 2016. Such plans, of course, are at the mercy of the budget cutting and government downsizing spreading in Washington. Lori B. Garver, the deputy administrator of NASA, insisted this week that the future was bright for human spaceflight. “We are tapping into how we developed almost everything great in this country, through commercial enterprise and competition,” Ms. Garver said. Other NASA officials noted that Congressional support for the new programs was bipartisan.

### Plan popular – empirically proven: Obama recently funded a space exploration project

Edwards 4/22 [Julia – writer for the National Journal. “Spending bill funds NASA mission to the moon”. April 22, 2011. http://www.govexec.com/dailyfed/0411/042211nasa-budget.htm ayc]

Among the budget cuts that President Obama had to agree to in order to avert a government shutdown, Republicans re-gifted him one that he willingly made long ago: $3.8 billion to further NASA's space explorations. The money will fund NASA' s Constellation Program, which was cut entirely under the president's initial fiscal year 2011 budget proposal. The pride of the Constellation Program is the Orion capsule, NASA's most innovative spacecraft, for sending men to the moon. The Orion was a priority of former President George W. Bush's, but plans for construction were halted by the current administration in 2009. Bipartisan pressure from senators from states with a heavy NASA presence revived funding in fiscal year 2010. Sens. Kay Bailey Hutchison, R-Texas, Bill Nelson, D-Fla., and Barbara Mikulski, D-Md., championed the reauthorization of the Constellation Program on October 11, 2010, which led to the unveiling of the first Orion space capsule in March of this year. At a hearing with NASA on April 11, Mikulski applauded NASA's work in creating jobs in the states where space capsules, such as Orion, are built. "Every time NASA lifts off, it takes the American economy with [it]," Mikulski said. "Because [NASA] is about innovation and it is about jobs." The government funding deal for the remainder of fiscal 2011 continues the appropriations authorized in 2010 to continue NASA'S exploration into space with the advancement of the Orion and the creation of a heavy-lift rocket. Following Congress's passage of the spending bill, NASA Administrator Charles Bolden said in a statement: "We appreciate the work of Congress to pass a 2011 spending bill. NASA now has appropriated funds to implement the 2010 Authorization Act, which gives us a clear path forward to continue America's leadership in human spaceflight, exploration, and scientific discovery." While exploration funding is extended at 2010 levels, some NASA programs, like education outreach, have been cut. NASA is currently formulating its operating plan and has 60 days following the passage of the spending bill to submit the plan to committees.

### Chairman of a gov’t organization supports the plan

Hall 6/7 [Ralph M – Chairman of the Committee on Science, Space and Technology. “On Eve of Historic Final Launch, Chairman Hall Reflects on Space Shuttle Program, http://science.house.gov/press-release/eve-historic-final-launch-chairman-hall-reflects-space-shuttle-program ayc]

Washington D.C. – Today, Science, Space, and Technology Committee Chairman Ralph M. Hall (R-TX) made the following statement, reflecting on the Space Shuttle Program and all of its successes: “Having served on this Committee since I was first elected to Congress in 1980, I have had the pleasure of being involved with the Space Shuttle Program since Columbia’s maiden voyage back in April, 1981. It has been an honor to have attended several launches, every time feeling the anticipation of the countdown and lift-off. We have watched in awe as the Shuttles rocketed into space, and we have felt the shock and sorrow when Columbia and Challenger ended in tragedy. We will always remember those brave Astronauts who lost their lives, and we should honor their courage and sacrifice by continuing their work to better America through space exploration and scientific discovery. “Along with being a source of pride and inspiration for the last thirty years, the Space Shuttle Program has also helped to preserve America’s role as the global leader in innovation and engineering. The Space Shuttle is the first manned spacecraft ever developed that can achieve orbit, land back on earth, and then be reused. Including tomorrow’s launch, the Program will have launched 355 different individuals from 16 countries, ferrying astronauts into earth orbit to build and utilize the International Space Station, possibly the most challenging engineering project ever undertaken. The Program has also delivered a multitude of scientific satellites and instruments into orbit that have expanded humanity’s understanding of the universe. “The talented men and women of NASA’s Space Shuttle team have done an extraordinary job, continually pushing the boundaries of science and engineering. They deserve tremendous credit for their accomplishments and their continuing commitment to the success of our nation’s endeavors in space. The Space Shuttle has been a remarkable national capability that will be missed once the STS-135 mission crew returns safely to earth from its final voyage, and Atlantis is retired along with the rest of the fleet. I salute the four brave astronauts, led by Commander Doug Hurley, as they depart on this historic mission. “With the retirement of the Space Shuttle, NASA will face a critical period and will need Congress’s support and direction to focus its limited resources on sustaining America’s leadership in space. We are in a challenging budget environment, but I believe that ensuring U.S. access to space is vital to our national interests. I believe human space exploration should be a national priority. In order for the U.S. to remain a leader in space exploration Congress has given NASA a blueprint in last year’s authorization bill, which is now law. The Space Launch System and Multi Purpose Crew Vehicle are important priorities that can also ensure the U.S. achieves assured access for American crews, in case commercial ventures do not materialize or our international partners become unable to provide access to the Space Station. As Chairman of the Science, Space, and Technology Committee, I will continue to make sure that NASA follows this path, so that America will remain the preeminent leader in space exploration.”

### Obama supports space exploration

White House 10 [“Remarks by the President on Space Exploration in the 21st Century”. April 15, 2010. http://www.whitehouse.gov/the-press-office/remarks-president-space-exploration-21st-century ayc]

And leading the world to space helped America achieve new heights of prosperity here on Earth, while demonstrating the power of a free and open society to harness the ingenuity of its people. And on a personal note, I have been part of that generation so inspired by the space program. 1961 was the year of my birth -- the year that Kennedy made his announcement. And one of my earliest memories is sitting on my grandfather’s shoulders, waving a flag as astronauts arrived in Hawaii. For me, the space program has always captured an essential part of what it means to be an American -- reaching for new heights, stretching beyond what previously did not seem possible. And so, as President, I believe that space exploration is not a luxury, it’s not an afterthought in America’s quest for a brighter future -- it is an essential part of that quest. So today, I’d like to talk about the next chapter in this story. The challenges facing our space program are different, and our imperatives for this program are different, than in decades past. We’re no longer racing against an adversary. We’re no longer competing to achieve a singular goal like reaching the Moon. In fact, what was once a global competition has long since become a global collaboration. But while the measure of our achievements has changed a great deal over the past 50 years, what we do -- or fail to do -- in seeking new frontiers is no less consequential for our future in space and here on Earth. So let me start by being extremely clear: I am 100 percent committed to the mission of NASA and its future. (Applause.) Because broadening our capabilities in space will continue to serve our society in ways that we can scarcely imagine. Because exploration will once more inspire wonder in a new generation -- sparking passions and launching careers. And because, ultimately, if we fail to press forward in the pursuit of discovery, we are ceding our future and we are ceding that essential element of the American character. I know there have been a number of questions raised about my administration’s plan for space exploration, especially in this part of Florida where so many rely on NASA as a source of income as well as a source of pride and community. And these questions come at a time of transition, as the space shuttle nears its scheduled retirement after almost 30 years of service. And understandably, this adds to the worries of folks concerned not only about their own futures but about the future of the space program to which they’ve devoted their lives. But I also know that underlying these concerns is a deeper worry, one that precedes not only this plan but this administration. It stems from the sense that people in Washington -- driven sometimes less by vision than by politics -- have for years neglected NASA’s mission and undermined the work of the professionals who fulfill it. We’ve seen that in the NASA budget, which has risen and fallen with the political winds. But we can also see it in other ways: in the reluctance of those who hold office to set clear, achievable objectives; to provide the resources to meet those objectives; and to justify not just these plans but the larger purpose of space exploration in the 21st century. All that has to change. And with the strategy I’m outlining today, it will. We start by increasing NASA’s budget by $6 billion over the next five years, even -- (applause) -- I want people to understand the context of this. This is happening even as we have instituted a freeze on discretionary spending and sought to make cuts elsewhere in the budget. So NASA, from the start, several months ago when I issued my budget, was one of the areas where we didn’t just maintain a freeze but we actually increased funding by $6 billion. By doing that we will ramp up robotic exploration of the solar system, including a probe of the Sun’s atmosphere; new scouting missions to Mars and other destinations; and an advanced telescope to follow Hubble, allowing us to peer deeper into the universe than ever before. We will increase Earth-based observation to improve our understanding of our climate and our world -- science that will garner tangible benefits, helping us to protect our environment for future generations.

### Congress backlashed against cancellation of Constellation

Freeman 10 [August 13, 2010. Marsha - Associate Editor at 21st Century Science & Technology. “Congress Defends U.S. Space Exploration” ayc]

Aug. 3—Rising above party politics and parochial interests, both the House of Representatives and the Senate have handed a resounding defeat to the White House; to an Administration that asserts in private that the space program is a “waste of money.” The Congress has declared its intention to halt the destruction of the nation’s leading science and exploration capability. But only with President Obama removed from the White House, will there be the possibility to embark on the multi-decade exploration of space that this country and the world require. Over the past year, Congress has been battered into approving President Obama’s health-care “reform,” which will lead to the premature and unnecessary deaths of America’s most vulnerable citizens; and a financial “reform” bill that condones the growth of the financial cancer that is destroying the U.S. economy

### NASA’s budget is the only one the GOP is not willing to cut

Svitak 3/17 [March 17, 2011, Amy Svitak – writer for Space News. “GOP Members Seek Earth Science Cuts.” ayc]

WASHINGTON — Two Republican lawmakers appealed to House Budget Committee Chairman Rep. Paul Ryan (R-Wis.) to spare NASA’s manned space exploration programs from the budget axe next year while suggesting the agency’s roughly $1.6 billion request for climate-monitoring initiatives is ripe for cuts. “The establishment of, and commitment to, human space exploration is critical to our country’s national security and economy, and we respectfully ask that our Republican budget reflect this national priority,” Reps. Sandy Adams (R-Fla.) and Pete Olson (R-Texas) said in a March 17 letter to Ryan, whose job as budget chief is to establish top-level spending allocations for the coming fiscal year that begins Oct. 1. Adams and Olson, who represent states with a stake in NASA’s manned spaceflight program, said the current fiscal situation is forcing hard choices as members of the GOP-led House seek to curb discretionary spending at federal agencies. “To be clear, we believe that NASA’s budget can be reduced,” the lawmakers wrote, urging Ryan to take aim at climate-monitoring programs poised for a modest funding boost over the next five years under the $18.72 billion budget blueprint U.S. President Barack Obama unveiled Feb. 14. “Within the NASA budget specifically, we believe there is an opportunity to cut funding within the Earth Science account where an overabundance of climate change research is being conducted,” they wrote. The members lauded America’s history of global leadership in space exploration but criticized Obama for what they said was undermining the nation’s leadership in space exploration. Obama’s plan also supports commercial astronaut transportation services and space technology development over deep space exploration systems favored by Congress. “[O]nce again, the Obama Administration’s budget willingly cedes that leadership to China, Russia and India — countries that understand the importance of human space exploration,” the letter states. “We cannot continue to accept this administration’s assault on American exceptionalism and world leadership.”

### Poll proves: Majority of Congress and the public support space exploration

Gonnella 7/6 [July 06, 2011. “As NASA prepares for the end of the shuttle era, two-thirds of GOP voters say the nation must continue to play a leadership role in space exploration”. Natalie Gonnella ayc]

Friday may mark the last flight of the US shuttle program, but Americans are adamant that US space exploration must continue. As NASA prepares for the final lift off of the 30 year program, a new poll from the Pew Research Center reveals that nearly six in ten Americans agree that it is essential that the country continue to be a world leader in space exploration. And reflecting on the program's 135 flights, 55% of Americans view the shuttle program as a good investment for the nation, **with Republicans being the most supportive of US innovation in space exploration: Majorities in nearly all demographic groups say it is essential that the U.S. continue to be at the vanguard of space exploration.** And partisan groups largely agree that American leadership is vital, although this view is more prevalent among Republicans. Two-thirds of Republicans (67%) say the nation must continue to play an international leadership role in space exploration; smaller majorities of Democrats (54%) and independents (57%) say this.

## Plan popular – Moon

### Miraculously, space exploration to the moon is bipartisan in the midst of the extremely partisan Congress

Kennedy 10 [Jack – on the board of directors of the Virginia Commercial Space Flight Authority that governs the Mid-Atlantic Regional Spaceport at Wallops Island, Va., October 3, 2010. “Bipartisanship charts new space policy course”ayc]

In this decade, humanity will reach into our solar system as never before. It is fitting to have a national space policy that reaches further and faster than we have ever sought to grasp previously as we stand on the brink of a fifty-year human space history. The adoption of the space policy in the fleeting moments of imperfect politics of 2010, the votes cast will echo through history. The new national space policy of the United States is on par with the moment this nation first decided to place humans on the surface of the moon, and in fact, it may be more significant; we just do not now realize it, but we will. Many are critical of President Barack Obama in the current economic recession. Such is our right as Americans. As space policy has been the cause of Americans to join hands previously across partisan and philosophical divides, most Americans want to take nationalistic pride in a can-do enterprise. Space technology spin-off into society is neither Democrat nor Republican; it is not conservative, libertarian, liberal or moderate. Advancing space technology is a part of the American frontier spirit for invention; we desire it. Just over the horizon of the immediate moment, humanity will again touch down on the lunar surface with Chinese, Russian, European, Japanese, Indian and American nationals in search of resources and knowledge. New American business leaders will cobble-together international space missions to determine the mineral content of near earth asteroids. NewSpace entrepreneurs will soon offer-up stays at space hotels in the next five or so years; and more humans will go to space in this decade than have in the past fifty years combined for adventure, exploration, and new wealth. **We have entered the Second Space Age with a stroke of late night Congressional bipartisanship.** The imperfect democratic process has seemed to work this time. We have a policy embark point; we now have a policy to set sail on the deep space frontier.

### Congress is bipartisan about going to the moon

Schmidt 09 [Klaus – professor @ the University of Vienna. “Lawmakers Voice Support for NASA Moon Program”. Sept. 18, 2009 ayc]

Members of a key Congressional committee on Tuesday voiced support for NASA’s Constellation program, designed to get astronauts back to the moon. The comments came a week after an expert panel said NASA’s plans were not possible, given its current budget. The occasion was an appearance by Norman Augustine, head of a committee formed to consider the future of human space exploration. The Augustine committee sent a summary report to the White House last week saying NASA needs at least an extra $3 billion a year to implement the Constellation moon program. The report also included several alternatives to that program. At a feisty session on Tuesday, Congress was having none of those alternatives, starting just minutes into the two-hour hearing. “NASA has been working for more than four years on the Constellation program, a development program in support of which Congress has invested billions of dollars over that same period,” said Science Committee chairman Bart Gordon. “As a result I think that good public policy would tell us that there needs to be a compelling reason to scrap what we’ve invested our time and money in over the past several years.” The Democratic chairman’s words were echoed minutes later by the top Republican on the Science Committee, Ralph Hall. “It is hard for me to understand why the president is seeking new options at all when there has been an agreed-upon plan for several years. Why don’t we just fund the program we’ve all agreed to?” But Norman Augustine stressed that by his committee’s analysis, NASA’s Constellation program — given the current budget — is, as they might say at the space agency, a no-go. “And the reason for that, the primary reason, is the mismatch between the task to be performed and the funds that are available to support those tasks.” The Augustine report includes several options for human spaceflight, but in his Congressional appearance, Mr. Augustine emphasized that they were just that — options, not recommendations. “We’ve tried very hard not to wind up being in the position where we make a recommendation as to a program, but each of the options does have liabilities, including the current program. All the others have them, too. Each has their benefits, and it’s really up to the decision maker to make a judgment as to how to weigh those.” When Augustine referred to the “decision maker,” he was talking not only about President Obama, but also about Congress, which appropriates the money to pay for space exploration. Most of the options in the Augustine report were based on a budget increase of $3 billion a year. By comparison, NASA’s current budget for all its programs is about $18 billion.

### A mission to the moon is sacred to Congress

Raju & Bresnahan 4/20 [Manu - a congressional reporter at POLITICO. John - a senior congressional reporter for POLITICO. “Shooting for the moon amid cuts”. 4/20/11 ayc]

**For all the rhetoric about cutting government spending, NASA’s space mission remains sacred in Congress. A handful of powerful lawmakers are so eager to see an American on the moon** — or even Mars — that they effectively mandated NASA to spend “not less than” $3 billion for a new rocket project and space capsule in the 2011 budget bill signed by the president last week. NASA has repeatedly raised concerns about the timeframe for building a smaller rocket — but the new law expresses Congress’s will for the space agency to make a massive “heavy-lift” rocket that can haul 130 metric tons, like the ones from the days of the Apollo. Congressional approval of the plan — all while $38 billion is being cut elsewhere in the federal government — reflects not only the power of key lawmakers from NASA-friendly states, but the enduring influence of major contractors like Lockheed Martin and Boeing in those states.

### Lunar colonization popular---perception of winning the new space race

Dinkin 04 [Sam - columnist for the Space Review, September 7, 2004, “Colonize the Moon before Mars,” online: http://www.thespacereview.com/article/221/1]

Politics The Moon may become a very exciting destination with a substantial GDP. Being there first means that the high ground is already occupied for any future militarization of the Moon. It’s possible that colonizing the Moon will help muster the political will to colonize Mars. Earthers will be able to see the colony directly with their own eyes. A convincing existence proof will be there for everyone to see that colonization is feasible and profitable. A lunar colony is a politically feasible off-Earth gene bank increasing the chances that the species will be immortal. The act of leaving the cradle may be the other addition to our chances for immortality.

### Large, bipartisan majorities support lunar exploration; it’s feasible

Spudis 10 – Paul D. Spudis, Senior Staff Scientist at the Lunar and Planetary Institute, February 9, 2010, “The New Space Race,” online: http://www.spudislunarresources.com/Opinion\_Editorial/NewSpaceRace.pdf

The Vision for Space Exploration (the Vision, or VSE,) announced by President Bush in January 2004, called for returning the Shuttle to flight after the Columbia accident, completion of the International Space Station, a human return to the Moon and eventually voyages to Mars and other destinations. This proposal was subsequently endorsed by two different Congresses (in 2005 and 2008) under the control of different parties; both authorizations passed with **large bipartisan majorities**. The preface to the founding VSE document states that the new policy is undertaken to serve national “security, economic and scientific interests.” Subsequent statements and writings elaborated on the purpose of the VSE. Despite concerted efforts to distort its meaning, the goal of lunar return was not to repeat Apollo but to create a long-term, sustained human presence in space by learning to use the material and energy resources of the Moon**.** The VSE was to be implemented under existing and anticipated budgetary constraints; the guidance given to NASA for this The preface to the founding VSE document states that the new policy is undertaken to serve national “security, economic and scientific aspect of the mission was to stretch timetables if money became short. The idea was to create this new system with small, incremental, yet cumulative steps.

## Obama has no PC

### Poll proves – there’s no PC

Page 7/18 [Susan - Washington bureau chief for USA Today. “Poll: Low ratings for Obama, Congress on debt talks”. July 18, 2011 ayc]

WASHINGTON — Americans aren't pleased by what they see going on with the debt-ceiling negotiations in the capital. Half of those surveyed in a USA TODAY/Gallup Poll say President Obama and the current Congress are doing a worse job than their predecessors in dealing with the nation's problems, and four in 10 call the situation the worst they've seen in their lifetimes. At least two-thirds accuse congressional Republicans and Democrats of putting their own political interests ahead of the country's best interests. Obama fares better on that question, although he scores only an even split between those who say he's watching out for his own interests and those who say he's looking out first for the nation. "It's discouraging," says John Ross, 71, a moderate Republican from Tavares, Fla., who was contacted for the poll. "The divide has gotten greater between Republicans and Democrats, and the concept of bipartisanship has gone out the window — and the country is suffering."

### The public is dissatisfied with Obama and the Congress

Epstein 7/18 [Jennifer – Staff writer at POLITICO. “Poll: 40% say worst gridlock ever”. July 18, 2011 ayc]

Washington is locked in the worst gridlock they’ve seen in their lifetimes**, four in 10 Americans say as they voice dissatisfaction with how President Barack Obama and members of Congress are handling the country’s problems**. More than two-thirds of those surveyed for a USA Today/Gallup poll released Monday say that members of Congress of both parties are putting their own interests ahead of the country’s, while they’re evenly divided on whether the president is more driven by his own interests or the country’s. The president’s overall approval rating in the poll is 45 percent in the poll, which gives him higher standing than congressional Democrats or Republicans. Thirty-three percent of Americans say they approve of Democrats in Congress, while 28 percent say they approve of Republicans. With approval ratings low, Americans are unsure of whether congressional Republicans and the president will be able to reach a deal, with 49 percent saying there will be a deal, while 47 percent say there won’t be one.

### No PC – Obama losing to a generic Republican Candidate in elections

Stanley 7/18 [Paul – reporter for the Christian Post, “Obama Trails Generic Republican Candidate in New Poll”, July 18, 2011 ayc]

With about a dozen candidates seeking the Republican presidential nomination, they should all rejoice in a new Gallup poll that shows President Obama coming in eight points shy of a “fill in the blank” Republican candidate. The poll of 897 registered voters interviewed July 7-10 shows that 39 percent say they would vote for President Obama in 2012, while 47 percent said they would vote for “the Republican Party’s candidate for president.” The poll has a margin of error of four percent. Obama support is unchanged from last month but is down from 43 percent in May when the president’s approval rating saw an upswing after the death of al-Qaida leader Osama bin Laden. At that time, a generic Republican candidate had 40 percent support in May. Beginning in June, the GOP candidate has drawn more support than Obama, with 44 percent saying they’re more likely to vote for the Republican. The latest increase to 47 percent is the second consecutive month that shows a Republican candidate outpolling Obama. Jeffery Jones of Gallup noted in his report that independent voters should be causing President Obama the most concern since independents favor a Republican candidate over a Democrat 44 to 34 percent. Republicans are showing slightly more loyalty to their party’s candidates than are Democrats. “President Obama’s re-election prospects do not look very favorable at this point – if the election were held today, as measured by the generic presidential ballot,” wrote Jones. “However, that result does not necessarily mean he is likely to be denied a second term in November 2012. At this point in 1991, George H.W. Bush looked like a sure bet to win a second term, but he was defeated.” University of Virginia political analyst Kyle Kondik added a different twist to the poll’s results. “When you poll voters and insert another candidates name in the blank, Obama is still out performing everyone other than Romney,” said Kondik. “We’re still a long way out from November 2012 and voters will change their minds many times between now and then.” Interestingly, a Wall Street Journal/NBC poll in mid-June suggested the underlying reason for Obama’s vulnerability is due to voters seeing Obama as “owning” the economy and its 9 plus percent unemployment rate. Over 82 percent of voters surveyed in that poll now consider Obama responsible for the nation’s economy. Noted Kondik, “As far as the economy goes, it’s more perception than reality at this point.” Meanwhile, President Obama is threatening to veto the House Republican plan to balancing the budget and raising the debt ceiling, saying it “would undercut the United States’ ability to invest in the future and lead to severe cuts across great swaths of government spending.”

### Obama won’t keep his PC – it’s just a stroke of luck

Walter 7/18 [Amy - ABC News Political Director. “How Much Longer Can Obama Defy Political Gravity?” July 18, 2011 ayc]

Although President Obama’s job approval rating of 48 percent (according to Pollster.com average) isn’t exactly stellar, it is remarkably high given the level of economic pessimism and despair among American electorate. The economy is the most important issue for most Americans, yet few Americans feel very good about it and most don’t approve of the way President Obama’s dealing with it. The most recent Quinnipiac poll found that just 38 percent of Americans approved of the job the president was doing on the economy and just 27 percent were “satisfied” with the direction of the country. Polling done by ABC News/Washington Post and CBS/New York Times in June found similar results on both counts. Even so, President Obama’s job approval in the Quinnipiac Poll was 47 percent, a full nine points higher than the 38 percent who thought he was doing a good job on the economy. In the ABC /Washington Post poll, his overall approval rating was seven points higher than his approval rating on the economy. In the CBS/New York Times poll, the gap between his overall approval rating and his handling of the economy was 8 points. **Obama’s job approval ratings defy political gravity.** The only question now, is if they can do so for much longer. Psychologists talk about “cognitive dissonance,” the tension that people feel when their thoughts are inconsistent with one another. In this case, it’s feeling as if the president is doing a pretty lousy job on the economy, but still giving him decent (though not glowing) marks when it comes to his overall presidency. At some point, psychologists will tell you, relief from the tension comes only when you try to restore consistency. In this case, it means that either voters need to start feeling better about Obama’s handling of the economy or they will start to feel worse about his overall ability to handle of his job. The greatest example of this cognitive dissonance was President George H.W. Bush. Even as he was riding high in job approval ratings thanks to the U. S. success in the Gulf War, voters were showing signs of restiveness about his handling of the economy. In July of 1991, according to ABC News/Washington Post polling, Bush’s approval rating was 70 percent, even as just 36 percent approved of the job he was doing on the economy and just 30 percent thought the country was headed in the right direction. By June of 1992, the laws of political gravity and cognitive dissonance had taken their toll on Bush. At that point, only 23 percent of Americans approved of the job Bush was doing on the economy and his overall job approval rating was 35 percent. The connection between economic approval and job approval was also evident during President Ronald Reagan’s tenure. When voters disapproved of his handling of the economy, Reagan’s approval ratings suffered. But, as the economy started to turn around in late 1983 and early 1984, Reagan’s approval ratings in both his handling of the economy and his overall approval rating started to rise as well. By September of 1984, according to ABC News/Washington Post polling, 54 percent of Americans gave him positive ratings on his handling of the economy and he had a 58 percent approval rating. In the last 30 years only one president, George W. Bush, has been re-elected with an overall approval rating under 50 percent. It’s worth noting, however, that his approval rating of 48 percent was basically in line with his approval ratings on the issues that voters were most concerned about in 2004: terrorism, the economy and Iraq. This isn’t to say that Obama’s overall approval rating is the only thing that will determine his re-election chances. Obviously, his Republican opponent and the political climate in 2012 are important too. But, it’s fair to assume that the economy will reign as the most important issue for voters in 2012. Voters don’t blame Obama for getting the U.S. economy into this mess, but they do want him to get us out of it. Today, they are still giving him the benefit of the doubt. Will they still feel that way next fall?

### Obama lost PC after cancelling Constellation

Faith 10 [G. Ryan – an independent technology consultant and Adjunct Fellow for Space Initiatives at the Center for Strategic and International Studies, (CSIS). “President Obama’s Vision for Space Exploration (part 2)”, The Space Review, <http://www.thespacereview.com/article/1616/1>]

There has been some immediate opposition to various elements of President Obama’s new plan from Capitol Hill, primarily in objection to the cancellation of the Constellation program, and to a lesser extent, a perceived lack of concrete direction in the President’s new plan. Should President Obama’s plan survive these immediate challenges without major alteration, success will ultimately depend on the long-term political ability of the program to avoid cancellation over the next several election cycles.

### No PC – debt ceiling

Hudson 6/5 [Jerome – a member of Project 21 a sponsorship of the National Center for Public Policy Research. “Lower the Debt Ceiling and Raise Our Moral Ceiling”, http://www.humanevents.com/article.php?id=43940, June 5, 2011]

The Obama administration wants Congress to raise the debt ceiling so our government can borrow more than the almost $14.3 trillion currently allowed by law.  Conservatives want any debt increase tied to spending cuts, and a recent vote shows Obama lacks the political capital to ram through an increase as he might have in the past.

## Partisanship High

### Partisanship is at an all-time high

Allen & Bresnahan 6/30 [Jonathan - a winner of the National Press Foundation’s Everett McKinley Dirksen Award for Distinguished Reporting of Congress and the National Press Club’s Sandy Hume Award for Excellence in Political Journalism. & John - a senior congressional reporter for POLITICO. He comes to us after more than a decade covering Congress, most recently as a reporter and editor for Roll Call. He is one of the most well-sourced journalists on the characters, history and procedures of Congress. “Dysfunctional Congress 'worse' than ever?”. http://www.politico.com/news/stories/0611/58076.html. June 30, 2011]

The back-and-forth between Obama and Boehner aptly demonstrates how the partisan gulf has only gotten worse since the GOP landslide in November, leaving Washington just as dysfunctional as before the election. Throughout the 112th Congress, lawmakers and the White House have cut deals only when pushed to the very edge of political or [budgetary disaster](http://www.politico.com/news/stories/0411/52836.html), and neither side has walked away from those agreements with its supporters pleased by the results. It is governing while balanced on a knife’s edge, yet neither side seems ready to back down — not with a presidential election looming next year. Many current and former lawmakers complain that the stalemate on the Hill is worse than ever, even going back to the bitter partisan wars of the 1990s and the impeachment of President Bill Clinton. “I don’t think there’s a single person in the United States who thinks that Congress is working right now,” said former Rep. Artur Davis, a moderate Alabama Democrat who retired last November. “There’s a sense that the partisanship is worse than it’s ever been.”

### Nothing will pass – Republicans and Democrats

Allen & Bresnahan 6/30 [Jonathan - a winner of the National Press Foundation’s Everett McKinley Dirksen Award for Distinguished Reporting of Congress and the National Press Club’s Sandy Hume Award for Excellence in Political Journalism. & John - a senior congressional reporter for POLITICO. He comes to us after more than a decade covering Congress, most recently as a reporter and editor for Roll Call. He is one of the most well-sourced journalists on the characters, history and procedures of Congress. “Dysfunctional Congress 'worse' than ever?”. http://www.politico.com/news/stories/0611/58076.html. June 30, 2011]

Most of the time, it seems Republicans and Democrats aren’t even speaking the same language. House GOP leaders are working feverishly to appease a party base that wants the president’s health care law repealed, Medicare and Medicaid benefits slashed, business regulations overturned and income tax rates frozen or lowered — although most of their agenda will never be implemented with Democrats running the Senate and the White House. Democrats, for their part, are trying to motivate their own base, which is unhappy with Obama and any moderates who want to cut deals with GOP leaders.

## Public Interest---Space Exploration

### Public interest key - the public’s curiosity drives space exploration

Friedman 1/10 [Lou - co-found The Planetary Society, he brought to his position as Executive Director a wealth of experience in the space exploration community. “Public interest and space exploration”. January 10, 2011 ayc]

Space interest rests on scientific discovery and adventure. I have focused on the largely ground-based story behind the new classification of Pluto, but the New Horizons mission and the public interest in discoveries of extrasolar planets move this story into space. In many respects, our discoveries about planets are the public face of the space program. This is accentuated when the possibility of extraterrestrial life is raised. The Mars life possibility, which commanded the attention of President Clinton in 1996, illustrates that. The long-sustained public interest in the travels of Spirit and Opportunity demonstrate it as well. I don’t mean to say that only planets excite the public imagination: Hubble’s remote probing of the universe became a people’s mission, so much so that when NASA considered abandoning it, popular interest prevented that from happening. I believe that the public is more scientifically curious and literate than is often assumed and that the possibilities of new discoveries about ourselves, other worlds, and the universe is what drives the space program. This even applies to the human space program, where I assert, based on 30 years leading the largest space interest group in the world, that the public perception is that humans are on a path outward to explore new worlds. Almost all of the popular talks I have given about planetary exploration have had a questioner in the audience ask either if humans were part of the existing Mars missions or when they would land there.

## Public Interest---Manned Space Missions

### Polls prove: Americans want manned space missions

Science Encyclopedia 11 [©2011, Public Opinion About Space Exploration - Is Space Exploration Important To Society? http://www.libraryindex.com/pages/1047/Public-Opinion-About-Space-Exploration-SPACE-EXPLORATION-IMPORTANT-SOCIETY.html ayc]

**Gallup polls show very strong support among Americans for crewed missions into space.** This is true despite the accidents that have taken astronaut lives. Soon after the Challenger and Columbia space shuttle disasters the Gallup Organization polled 462 adults about their opinions on manned missions. As shown in Figure 9.7 **more than 80 percent of the people asked in each poll thought the manned space shuttle program should continue**. Gallup also asked whether the United States should concentrate on unmanned missions or also include manned missions. (See Figure 9.8.) In both polls a healthy majority of the respondents expressed support for manned missions. The percentage actually increased from 67 percent in 1986 to 73 percent in 2003. **Obviously Americans want human explorers to venture into space.**

### The American opinion in NASA and manned space exploration is increasing

Carreau 7/14 [Mark - Reported on U. S. human and robotic space exploration for more than two decades. “Poll Finds Americans Support Human Space Exploration”. June 14, 2011 ayc]

Seventy four percent of adult Americans believe it is at least somewhat important for the United States to have a human space exploration program, and 77 percent of those surveyed have a favorable opinion of NASA, according to a new public opinion survey from Rasmussen Reports. Seventy three percent also believe its important for the United States to excel at robotic exploration, according to findings released on July 12. Those who share a favorable view of NASA are up from 64 percent in January 2010, and nearly match the 80 percent from October. The telephone survey of 1,000 adults conducted on July 9-10 found that 50 percent of Americans believe NASA's 30-year-old space shuttle program has been worth the investment.

## Public Interest---Moon

### Poll proves – 2/3 of Americans support returning to the moon

Malik 06 [Tariq – staff writer for space.com. “Poll: Support Still Strong for Space Exploration Vision”. Sept. 25, 2006 ayc]

American support remains strong for NASA's plan to complete the International Space Station (ISS), retire its shuttle fleet by decade's end and move on to the Moon and Mars, according to poll results released Monday. The new survey - the last of a three-part series sponsored by the industry group the Coalition for Space Exploration - found that **more than two-thirds of Americans polled support NASA's stepping-stone approach to returning astronauts to the Moon**, provided the effort's cost does not exceed more than one percent of the federal budget. "I think the stability of the numbers over time is probably the most significant thing,"Jeff Carr, chairman of the Coalition of Space Exploration, told SPACE.com of the three surveys. "Our mission is to help broaden the public's awareness of the value and benefits of space exploration."

## Public Interest Key

### Public interests is key to implementation

Liptak 7/8 [Andrew - holds a degree in History and a master's degree in Military History from Norwich University. “The era of space exploration is just beginning”. July 8, 2011 ayc]

**Interaction with the public was essential**, and was a conscious point when the post-Apollo mission for NASA was put to paper: without general support from the public, interest in the space program would evaporate, quickly. NASA had to produce results and engage the public, and it had to do so cheaply. The American public had become increasingly unhappy with the price tag of America's space ambitions, despite the importance placed upon its success.

### Public interest key – without it, no one knows what might happen

Papalardo 10 [Joe – author for Popular Mechanics, March 9, 2010, “What Happens If NASA's Constellation Program Dies?,” online: http://www.popularmechanics.com/science/space/nasa/4343791]

The legacy of the era could become evident in a decade, when India or China succeeds in returning humanity to the moon. This achievement meant something for national prestige and scientific innovation in the 1960s and it means similar things now. NASA has long been a cradle for innovation as well as innovators. Without the appeal of a human flight program, will fewer aspiring scientists and engineers be lured into the agency and towards military and private space? Will the research end of NASA suffer from this lack of inspirational purpose? What are the geopolitical ramifications, if any, of this waning of American power? 4) What will the next big launch vehicle look like? And when will it be ready? NASA is seeking alternative ideas for a new heavy-lifting launch vehicle, a move that increased the odds that Ares V is considered doomed by NASA. Will the agency adapt military rockets, build a new launch vehicle from scratch or adapt components from the Space Shuttle program to make a new design from established parts (and possibly save jobs from existing production lines)? When will this new craft be ready, anyway, and what will it be used for? This debate was settled with Constellation—a reassessment will be delayed by political and engineering debates. 5) Are NASA astronauts going extinct? Heroic Explorers Wanted: Only Robots Need Apply. NASA's most exciting missions to other planets are based on robotic probes. For example, the agency is now evaluating three interplanetary missions, all of which involve sending robots to explore in our stead. The winner of the ongoing contest will receive $650 million to send a probe either to the moon, to Venus or to an asteroid, ready to launch by 2018. That's a pretty good value compared to Constellation, but colonization is the next historic step into space, and without a human space flight program, any extra-planetary colony under a U.S. flag will be populated by robots. Or a NASA astronaut will be visiting the Chinese or Indian moonbase.

# Space Disease DA 2AC

### Aff-Turn –The biotech industry is key to prevent disease spread- discovery of salmonella vaccine proves

NASA Academy, 8

[NASA Academy, researchers in aeronautics and space, "Roadmap to a Space Faring Civilization," August 2008, http://commercialspace.pbworks.com/f/NA08\_GSFC\_RSFC\_VER\_1.0.pdf, DA 7/20/11]//RS

Specifically the biotech industry performs rapid research and produces many of products, continuously moving to the next big market or new drug. With their high profits and desire to expand, biotech companies have taken great interest in space research, which may prove to be a gold mine for the first company willing to take it seriously. Since its beginning, the International Space Station (ISS) has been seen as a great opportunity for biotech companies to perform research in zero-gravity environments. Scientists and businessman alike, all anticipating access to the station, have been frustrated by the lack of time they have been permitted to use it. In 2005, the ISS was named a national lab, yet it remains to be extremely underutilized. Noting the intrinsic value of an orbital laboratory, biotech may be ready to advance its markets into space. The most notable recent success has an experiment performed by SPACEHAB, a space company aimed at extending space based products to the consumer market. On May 30, 2008, SPACEHAB, signed a Space Act agreement with NASA, making them one of the first commercial groups to have access to the station and guaranteeing them space on all but one of the remaining shuttle flights (44). Thomas Pickens III, CEO of SPACEHAB, stated that this --is expected to revolutionize a myriad of industries,|| and --will have a significant social and economic impact and shows great promise of saving lives and providing thousands of new jobs in the coming years" (45). That sentiment, shared by many throughout the biotech and other industries, has become one step closer to reality. SPACEHAB's recent agreement with NASA comes after successfully testing a salmonella vaccine aboard the ISS during STS-123 in March 2008. The Texas-based company flew tests again onboard STS-124, validating the previous results, leaving SPACEHAB with a vaccine which they will present to the Food and Drug Administration, hopefully start human tests as early as October (44), and market the vaccine in the next 2 to 3 years (46). SPACEHAB saw the potential market and have demonstrated promising results. Salmonella, chosen as a test case long before the most recent outbreaks, is the most common food poisoning agent in the United States. It affects over 40,000 people per year and is responsible for a loss of productivity valued at billions of dollars annually (47). According to the Center for Disease control, 400 people a year die of acute salmonellosis (48). Salmonella diarrhea is also one of the top 3 causes of infant mortality worldwide. Due to its widespread affects and previous experiments that showed salmonella was more virulent in microgravity, SPACEHAB targeted this vaccine as one that could prove the concept of vaccine development in space.

### Aff-Turn –Space bacteria discoveries help develop new medical treatments

Cook ‘11

(“Space bacteria could help protect human,” <http://websciencetechnology.blogspot.com/2011/03/space-bacteria-could-help-protect-human.html>, *Web Science and Technology*)

NASA studies how the bacteria that can infect humans in space are able to help improve the health of the astronauts and to provide new treatments on Earththe space agency said today. The research is carried out with data from Pseudomonas aeruginosa - the same that sick astronaut Fred Haise during the Mission of the 13th Apollo to the Moon in 1970 and Salmonella, deposited at the international space station (ISS). Scientists who study bacteria aboard space shuttle hope to discover the mysteries of how the agents that cause disease. The objective of this research, which began in 2006, is to know if handling in microgravity can lead to discovering vaccines and advanced therapies to improve the fight against infections. The director of the NASA, Charles Bolden, said in a statement that the Agency not only works to continue the work of the man in space, but that it is committed "to that science can make a real difference in the lives of the people" in the land. "The leadership of the NASA flight space human allows us to carry out innovative science and pioneer that reveals the unknown and opens the door to reveal the mysteries of how to work the agents that cause disease", said in a statement. The first results of this inquiry led by Cheryl Nickerson, Professor at the Centre of infectious diseases and vaccinology, of the Institute of Biodiseno of the State University in Tempe, Arizona, appear in the latest edition of the journal Applied and Ennvironmental Microbiology. "We have shown that space flights affect the regulatory mechanisms of bacteria that invariably cause disease in healthy individuals (Salmonella) and those that cause disease only in people with immune systems weak (Pseudomonas)," he said. To study the patterns of global gene expression of bacterial Pseudomonas and Salmonella pathogens Nickerson team has learned more about how to react to the reduced gravity. Pseudomonas aeruginosa can co-exist as a benign Microbe in healthy people, but it poses a serious threat to people with low immune system. It is the leading cause of death for those who suffer from cystic fibrosis and is a serious risk for burn victims. However, a dose high enough of Salmonella typhimurium always cause the disease, even in healthy individuals. In 2006 sent to the ISS on Board of one you the NASA shuttles the two samples of bacterial pathogens, Salmonella typhimurium and Pseudomonas aeruginosa, and a pathogenic fungus, Candida albicans. The crew left to grow the bacteria in the vessels suitable for several days and subsequently Nickerson team evaluated genes and expression of proteins, as well as virulent microbes response to changes in gravity. "We discovered that some environmental aspects which the microbes found during space flight seems to mimic the key conditions that are pathogens commonly found in our body during the natural course of infection, particularly in the respiratory system, gastrointestinal and urogenital system", said Nickerson. Apparently the space flight creates an environment of low shear (deformation produced in a solid by the action of two opposite, equal and parallel forces), where liquids are weak, while they flow over the surface of cells. This affects the regulators of molecular genes that can make that microbes are most infectious, although these same regulators could function similarly to regulate microbial virulence (the ability of an organism to cause disease) during the course of the infection in the human body. "This means that, in addition to safeguarding the future space travelers, this type of research can help the search for better therapies against pathogens on Earth," said the director of the Division of advanced capabilities of NASA, Benjamin Neumann.

### Aff- Daswani ’69 Evidence –Disregard their Daswani ’69 (South China Morning Post) card refers to him for any warrants- never graduated high school and tricked his way through college

Crewdson ‘1

(John Crewdson, Chicago Tribune, “Ben-Abraham fooled authorities into giving him medical degree,” <http://www.accessmylibrary.com/coms2/summary_0286-6732896_ITM>, 7/31/01, DA: 7/19/11, MadSu)

The distinction that for much of his life has set Avi Ben-Abraham apart is found in the 1987 edition of the Guinness Book of World Records: "The youngest to receive a Doctor of Medicine degree is Avi Ben-Abraham (b. Nov 18, 1957, Kfar-Saba, Israel) who graduated with the MD summa cum laude on Mar 4, 1976 from the Univ of Perugia, Italy, at the age of 18 years 3 months." Ben-Abraham has used that signal distinction, dressed up with a photograph of the 18-year-old doctor in a white lab coat, to gain entree into exalted circles of wealth and power and to persuade dignitaries, investors and the media that he is one of a kind. Never mind that Ben-Abraham's celebrated entry in the Guinness Book of World Records vanished after three years in print. "It was never actually accepted as a record," says a Guinness spokesman, Neil Hayes. "We never really received enough documentation to back it up." Of this there is no doubt: Avi Ben-Abraham does have a degree in medicine and surgery from the University of Perugia. But more than 100 interviews and hundreds of pages of documents obtained by the Tribune paint a picture of a young Israeli boy who, despite his record as an indifferent student and his apparent failure to even graduate from high school, managed to convince a powerful Italian professor that he was a genius and then to fool Italian authorities into believing hat he had fulfilled the academic requirements for becoming a doctor at the age of 18. Naftali Manheim, who taught Ben-Abraham chemistry at the First High School of Herzelyia, remembers nothing out of the ordinary about the young man, "not at all." But someone at his high school selected Ben-Abraham to attend a once-a-week, three-hour class at Tel Aviv University for youngsters with an aptitude for math. Over the years, the program has spawned several world-class mathematicians. But Avi Ben-Abraham didn't prove an outstanding pupil. "Nobody remembers him," says Dan Emir, the retired mathematics department chairman. "The really good ones you do remember." Although the program involved no examinations and carried no academic credit, it offered the opportunity to enroll in real math courses at the university the following year. But when Ben-Abraham tried to register, he was told that he first needed to graduate from high school. Records show the 15-year-old Ben-Abraham took some of the required high school graduation exams, known collectively as the Bagrut, but not all\_and that his performance on the exams he did take for was far from impressive.

### Aff –No Impact -Plasma zapper destroys foreign bacteria, preventing wide spread disease

ESA ‘11

(European Space Agency, “Zapping deadly bacteria using space technology,” <http://www.physorg.com/news/2011-05-zapping-deadly-bacteria-space-technology.html>, 5/27/11, DA: 7/19/11, MadSu)

Using plasma – superheated, electrically charged gas – Max Planck Institute for Extraterrestrial Physics director Gregor Morfill is developing ways to kill bacteria and viruses that can cause infections in hospitals. “What we have with plasma is the possibility to supplement our own immune system,” says Dr. Morfill. The research began on the International Space Station (ISS), where his ESA-funded physics experiments have been running since 2001. The first was ‘Plasmakristall Experiment Nefedov’ in cooperation with Russian partners. Later, the PK-3 Plus and PK-4 experiments flew in 2006 as part of ESA’s Astrolab mission. “It’s the longest-running space experiment in the history of human spaceflight,” notes Dr. Morfill. More than two dozen astronauts and cosmonauts have operated the equipment aboard the ISS. The work in space led to the realisation that plasma might have very practical terrestrial applications – and Dr. Morfill turned to ESA's Technology Transfer Program to make it a reality. Plasma dispensers can tackle a serious problem: in recent years, health experts have seen a dramatic rise in super-strains of bacteria that can survive the strongest antibiotics in medicine’s arsenal. One, the multiple drug-resistant Staphylococcus aureus – perhaps better known as MRSA – kills 37 000 people each year in the EU alone. It affects more than 150 000 patients, resulting in extra in-hospital costs of €380 million for EU healthcare systems. With help from ESA, Dr. Morfill’s team is now focusing on developing a system for hospitals, but cold plasma technology might one day also make it into our homes. Plasma could be used to disinfect toothbrushes and razors instead of UV light, which only sanitizes the surfaces it shines on. Plasma-charged gas would clean in hidden cracks and crevices, too. At the other end of the spectrum, he says that plasma could be used as a ‘planetary protection system’ to clean satellites and planetary probes so they don’t carry terrestrial bacteria to distant planets. The technology looks likely to do a lot of good. Bacteria are constantly evolving, developing resistance to the most commonly used antibiotics. Today, the best way to prevent the spread of bacterial infections is sanitation: regular hand washing between patients, for example, and systematic sanitising of floors, door handles, hospital curtains and anything else that might harbor infectious material. Instead, Dr. Morfill is designing a system that makes use of plasma’s innate antibacterial properties to make disinfection easy and quick. “It has many practical applications, from hand hygiene to food hygiene, disinfection of medical instruments, personal hygiene, even dentistry – this could be used in many, many fields

### Aff- No impact -Epidemic not likely to wipe out entire human race because of different vulnerabilities and resistances

Sowell ‘1

(Thomas Sowell, American economist and theorist, “The dangers of "equality,”” <http://www.jewishworldreview.com/cols/sowell030501.asp>, 3/5/01, DA:7/19/11, MadSu)

A sense of smell is just one of innumerable things that can differ greatly from one person to the next. Moreover, many of these differences are essential to the survival and progress of the human race. People have different vulnerabilities and resistances to a variety of diseases. That is why one disease is unlikely to wipe out the human species, even in one place. An epidemic that sweeps through an area may leave some people dying like flies while others remain as healthy as horses. There are children who are years late in beginning to talk and yet who end up scoring over the 90th percentile on math tests. Then there are other children whose speech is so precocious that they sound like little geniuses when you hear them talk -- and yet they have trouble subtracting two from four or tying their own shoelaces -- and always will. Individuals differ radically from one another in all sorts of skills, interests and talents. What all this means is that the capabilities of the human race vastly exceed the capabilities of even the brightest and the best individuals. When the brightest and the best take over making decisions for other people, usually through the power of government, those decisions are likely to be based on less knowledge, experience and understanding than when ordinary people make their own individual decisions for themselves. The anointed may know more than the average person, but far less than all the ordinary people put together. Scientists who study the brain say that some abilities develop greatly at the expense of other abilities. Socially as well, some talents are developed by neglecting others. Concert pianists seldom have a college education, because the demands of the two things are just too great. Therefore, for both biological and social reasons, the only way for everyone to be equal would be for them to be equal at a lower level of ability than what some people are capable of in some things and other people are in other things. In other words, if everyone were equal in their many capabilities, the whole species would be no more capable or insightful or resistant to diseases than one individual. Our chances of surviving or progressing would be a lot less than they are now. Even the enjoyment we get from watching Tiger Woods play golf or Pavarotti sing would be lost, for we would all be mediocrities in golf and singing and a thousand other things. A recent book on the publishing industry showed that 63 out of 100 best-sellers had been written by just six authors. It is not uncommon in baseball for just two players to hit more than half the home runs hit by the whole team. Ironically, the fact that nearly two-thirds of the best-sellers were written by the likes of Tom Clancy and Danielle Steel was revealed by a man who was one of the founders of the left-wing New York Review of Books. Yet one of the key assumptions of the left is that statistical disparities are suspicious, if not sinister, especially if these are differences in income and wealth

### Aff –No Impact-We can cure the diseases – tech, experience, and heart

Dingchao ‘8

(Han, “Can we cure all diseases in the future?” hospital manager and founder of VoiceofDingChao, <http://www.handingchao.com/can-we-cure-all-diseases-in-the-future/>, 7/7/08. DA: 7/20/11, MadSu)

With today’s hectic lifestyle, where most women are juggling careers, family, relationships, and a host of activities, the idea of possibly facing a serious illness in the future is not something that readily comes to mind — especially when a woman is in the prime of her life. But what most women don’t know, is that the key to treating a number of possibly life-threatening diseases that she, a parent, a sibling or even her children may face in later years, such as osteoporosis, heart disease, stroke, Alzheimer’s and Parkinson’s disease, may be found within her own body — in vital stem cells, which can now be harvested from her own menstrual blood. Now, thanks to the revolutionary research and technology of C’elle, a service dedicated to providing women with a safe and easy method of collecting and preserving stem cells found in her menstrual fluid each month, even the busiest woman can take control of her future, right in the privacy of her own home. With C’elle’s non-invasive collection process, menstrual cells are processed and cryo-preserved (stored at a very low temperature) for potential cellular therapies that may be used in the future. These self-renewing cells one day may even be used for sports medicine or cosmeceutical treatments, such as anti-aging therapies. “C’elle enables and empowers a woman to take control of her future health, and possibly of those genetically closest to her, in a fast, painless and stress free way,” said Michelle Kay, Marketing and Sales Manager for C’elle. “We live in exciting times, as science and technology are discovering how extremely valuable menstrual blood stem cells really are, and the enormous treatment potential they represent for future therapies. C’elle’s ongoing research is supporting these promising findings.” From this article, one thing is clear, we have achieved great success in stem cell research, and we are going to take next important action. And we have Celle Client Testimonial to prove this great research. But some of us don’t have enough courage to face some secret parts of our bodies, and we are too shy to talk them, this will stop our progress heavily. So what we need is treating science researches fairly, no bias, no limitation, if we can do this, I believe our technologies will develop faster and faster. In fact, as long as we realize that nothing is more important than health, we will treat everything related to health fairly naturally. Because life is the number one thing for all of us, we have no reason to refuse life, this is the power improving our research and technologies. Now let’s be back to the title, can we cure all diseases in the future? This is a complicated question, it is difficult to make an definite answer for it, but one thing is sure, as long as we don’t stop researching and we have fair eyes on everything, we will have ability to cure most diseases in the future. And now we have ability to expand the great results of stem cell research, we will use them perfectly in the coming years, this will be a great news in medical industry. So now we have enough faith to believe we will have enough ability to cure all disease in the future.

# Russian Aerospace DA 2AC

## Uniqueness

### NASA has not given Russia aerospace lead- announcement of future projects

Saavedra, 7/10 [Simon Saavedra, Christian Post Correspondent, “NASA After Atlantis: Mars, James Webb Space Telescope,” July 10, 2011, <http://www.christianpost.com/news/nasa-after-atlantis-mars-james-webb-space-telescope-52106/>, DA 7/16/11]//RS

NASA has boldly announced that the end of the shuttle program does not mean the end of NASA or better yet the end of NASA-manned missions to space. The space agency communicated its high ambitions for space explorations, saying it will be "designing and building the capabilities to send humans to explore the solar system, working toward a goal of landing humans on Mars," reads its website. NASA landed a spacecraft named the Mars Pathfinder on Mars in 1997 carrying the Sojourner rover which analyzed Mars' atmosphere, climate and geology. But now, NASA is hoping to land man resembling robots it has developed and has been testing it in order to improve the testing limitations of machines such as rovers. NASA, in cooperation with private companies, will also start building a new space vehicle called the Multi-Purpose Crew Vehicle designed for four astronauts in 21-day missions. NASA has reported that this space vehicle is just part of the next generation fleet it will start using for traveling beyond Low Earth Orbit (LEO). The agency also plans to direction its research in order for it to immediately benefit society such as building greener, quieter and simply better aircrafts or helping create better systems for today's hectic traffic – a move to garner more national interest? Perhaps. With these and other additional projects in development, NASA appears to be running under a full agenda and although it has suffered some setbacks such as the budget cut, it announced its commitment to stay in the lead for space exploration.

### US-Russian relations low- Russia’s alliance with Venezuela and threats of station bombers in Cuba

Carpenter & Logan, 7 [Ted Galen Carpenter and Justin Logan, “Cato Handbook for Policymakers,” p. 557, CATO Institute, March 26, 2007, <http://www.cato.org/pubs/handbook/hb111/hb111-53.pdf>, DA 7/18/11]//RS

Both governments need to adopt more cautious policies. Secretary of State Condoleezza Rice once famously dismissed the concept of spheres of influence as an obsolete notion, and that view has become all too common among America’s foreign policy elite. But that doctrine is very much alive, and U.S. and Russian leaders ignore that reality at their peril. If a new cold war emerges, Washington will have done much to invite it. But Russia has become needlessly provocative as well. The dark hints in summer 2008 that it might station bombers in Cuba were reckless. For Americans, even the possibility that Moscow might deploy a nuclear capable weapon system in Cuba brings back memories of the most nightmarish episode of the cold war—the Cuban missile crisis. No American government would tolerate such a move—nor should it. Moscow’s growing flirtation with Venezuela’s Hugo Chavez, an obnoxious nemesis of the United States, is also creating gratuitous tensions. Moscow’s joint air and naval exercises with Venezuelan military forces in September 2008 especially did not improve relations with America. Those moves likely reflect mounting Russian anger at U.S. policies that seem calculated to undermine Russia’s influence in its own backyard and even humiliate Moscow. Washington’s ‘‘in your face’’ approach is not a recent development. U.S. officials took advantage of Russia’s economic and military disarray during the 1990s to establish a dominant position in central and eastern Europe. Washington successfully engineered the admission of Poland, Hungary, and the Czech Republic to NATO in 1998—over the Yeltsin government’s objections. That expansion of the alliance was nonprovocative, though, compared with the second round earlier this decade that incorporated Latvia, Estonia, and Lithuania, entities that had been part of the Soviet Union

### Russian aerospace weak- lack personnel and funds

BBC, 3/30 [British Broadcasting Company, BBC Monitoring Former Soviet Union, “Personnel shortage hurts Russian aerospace sector's output,” March 30, 2011, DA 7/19/11]//RS

Moscow, 30 March: Russian aircraft sector enterprises are unable to fulfil large customer orders because of a shortage of personnel, the chairman of the Russian Trade and Industry Chamber's committee for developing the aerospace sector, Aleksandr Belousov, said today. "According to the most serious experts with an insider's knowledge of the situation, today not a single existing design bureau would be able not only to recreate a new modern airplane or an air engine but even simply reissue one of its own basic designs of the end of the 1970s-the start of the 1980s," Belousov said in his report to the second InfoSpace forum of innovation technologies. He said that if they were to get large orders serial production enterprises would not be able to fulfil them primarily because of a shortage of skilled personnel.

### Russian aerospace industry is stagnant now

De Carbonnel, 4/10 [Alissa de Carbonnel, contributing writer for the Moscow Tiimes, “Analysis: Stagnation Fears Haunt Russian Space Program,” April 10, 2011, Reuters, <http://www.reuters.com/article/2011/04/10/us-russia-space-gagarin-idUSTRE73910C20110410>, DA 7/17/11]//RS

As it celebrates the pioneering flight on April 12, 1961 that made Gagarin the first man in space, Russia nears another milestone: with the retirement of the U.S. shuttle program this year, it will be the only nation fit to provide rides to the International Space Station. It is a distinction for a country with a history of space firsts, beginning with the 1957 launch of the satellite Sputnik. U.S. space agency NASA pays a newly raised price of nearly $63 million each time it sends an astronaut to the orbital station aboard a Russian Soyuz craft from Russia's Baikonur Cosmodrome in Kazakhstan -- the launch pad for Gagarin's flight. But half a century after Gagarin's 108-minute voyage put the Soviet Union ahead in the Cold War space race, critics charge that reliance on Soviet designs as cash cows has stunted innovation, and that Russia has irretrievably lost its edge. "While we bask in the glory of having the only operating spacecraft, we are only making money off old rockets," said Vladimir Gubarev, the Soviet spokesman for the 1975 Apollo-Soyuz program, which achieved the first docking of U.S. and Russian spacecraft.

### Terminally non unique- Russia’s defense industry has no future- no investment, low morale, outdated equipment

Grove, 7/12 [Thomas Grove, Reuters correspondent to Russia, “UPDATE 1-Russia's Medvedev urges army to import weapons,” July 12, 2011, <http://www.reuters.com/article/2011/07/12/russia-medvedev-arms-idUSLDE76B1FI20110712>, DA 7/17/11]//RS

GORKI, Russia, July 12 (Reuters) - President Dmitry Medvedev, leader of the world's second largest arms exporter, urged the Russian military on Tuesday to buy weapons from abroad in order to ensure its forces are properly armed. The comments highlight increasing concern over Russia's decrepit arms industry and raise doubts that Moscow can complete an ambitious military modernisation programme. "You shouldn't buy junk," Medvedev told Defence Minister Anatoly Serdyukov and Deputy Prime Minister Sergei Ivanov, who oversees the defence sector for the government, at his residence just outside of Moscow. "If they (domestic arms makers) offer equipment which does not satisfy you, place your orders with other firms, or, ultimately, import them," Medvedev said. Russia signed an agreement last month to buy two Mistral class helicopter carriers from France in a 1.2 billion euro ($1.72 billion) deal, the first major foreign arms purchase in the two decades since the fall of the Soviet Union. Serdyukov was due to present the findings of a probe into arms contract failures after a top weapons designer said this year's contracts were doomed to fall short of targets . Russia's once - proud defence industry that armed Soviet satellites and allies during the Cold War has stagnated due to lack of financing and corruption. "I think Russia's defence industry doesn't have much of a future strategically. There are pockets of excellence or competance that will survive, but in general there is no energy there to sustain any steady growth or development," defence expert Pavel Podvig said . Prime Minister Vladimir Putin has promised to spend nearly 20 trillion roubles to rearm Russia's army, suffering from years of lack of investment, low morale and outdated equipment. Serdyukov said poor quality and overpricing of domestic arms were among the obstacles stopping the ministry from buying a remaining 230 billion roubles ($8.21 billion) worth of weapons out of a planned 750 billion in expenditures this year. A top weapons designer said last week that procurement failures were due to a lack of cooperation with the Defence Ministry. Analysts say the row stems from unaccountable price rises for key armaments, which the ministry refuses to approve. "You need to buy quality equipment at transparent prices, and not those put forward by certain companies," Medvedev said. Medvedev has repeatedly warned Russia's notoriously corrupt defence sector to clean up its act and this year sacked several industry chiefs over what the Kremlin said were unfulfilled contracts.

[Russia’s defense industry is also a part of the aerospace sector and therefore affects it as well.]

## Link

### No link- Russian aerospace will collapse inevitably- safety concerns

Reuters, 6/21 [Reuters, “Russia’s Civil and Military Aerospace Industry,” <http://www.reuters.com/article/2011/06/21/us-russia-aerospace-idUSTRE75K34D20110621>, DA 7/17/11]//RS

SAFETY CONCERNS Russian planes have been involved in two fatal crashes in the past 18 months, most notably the incident that killed Polish President Lech Kaczynski and 95 other passengers in April 2010. The most recent crash occurred when a passenger jet caught fire while trying to land in north-western Russia on Monday, killing 44 people and leaving eight survivors badly hurt. Both planes were Soviet-era Tupolev models. Russian President Dmitry Medvedev has swapped his Tupolev Presidential plane for a French-made executive jet.

### No link- Other rising countries will challenge Russia’s aerospace- Europe, China and Japan

Cook, 90 [Carol L. Cook, Professor of Aerospace Sciences at Yale University, “The Aerospace Industry: Its History and How it Affects the U.S. Economy,” <http://teachers.yale.edu/curriculum/search/viewer.php?id=new_haven_90.07.06_u>, DA 7/17/11]//RS

And, when Europe is unified, its Aerospace Industry is going to gain new impetus. Part of this will come from the gradual trend away from nationalistic rivalries toward a more perceptive and aggressive leadership. France has been advocating this sort of approach for many years, but could not implement it in the multi-national world that has been Western Europe. Leadership of the new and economically more powerful pan-European Aerospace Industry is almost certainly going to devolve onto French shoulders. Britain, West Germany, and Italy will all play key roles in the fields of technology, finance and marketing, but France alone among the major European powers has displayed the necessary combination of imagination, planning capacity and foresight to provide effective leadership in the world market. The French have been instrumental in establishing a proto-European Aerospace Industry--The Airbus Industry Consortium--that has demonstrated it can compete technologically with the U.S. The French also showed early on that they had the courage of their convictions in pulling out of NATO to avoid what they considered a too-great and too-long dependence on U.S. technology. The Chinese are also getting more into the Aerospace Industry. The People's Liberation Army Air Force of China is pursuing aircraft update projects and the phased development of two new designs in a forced modernization program that is structured to fit government-imposed austerity constraints. The Ministry of Aerospace Industry in China is coordinating a fundamental shift from military to commercial and export-oriented production in its factories throughout China as part of a plan to modernize the China industrial base with Western assistance. Ten years of political "openness" in China have created a strong environment for Aerospace manufacturing. Chinese factories build more than 20 types of bombers, fighters, trainers, and helicopters. This is a very strong base for the design and production of future aircraft for world markets. To increase efficiency, safety and aircraft comfort, Chinese design bureaus, factories and sub-system manufacturers are beginning to compete for projects. Joint ventures with foreign companies have helped introduce Western manufacturing equipment, technology and procurement philosophy in China. Japan is equally becoming strong in the Aerospace market. Japan is set to launch its first spacecraft to the Moon, a mission indicative of both Japan's interest in future lunar exploration and the maturing of space program capacities in the Pacific Basin. Large Japanese engineering companies have begun to spend millions of dollars of their own funds to develop technology that could be used for a manned lunar base. The Japanese companies hope these technology efforts will enable them to participate with the U.S. in the development of a manned lunar base early in the 21st Century.

### No link- other issues kill US-Russian relations- Arm sales to Iran, Iraq and North Korea

Gladkyy, 3 [Oleksandr Gladkyy, is an Edmund S. Muskie Fellow in international affairs at Southwest Missouri State University, “American Foreign Policy and U.S. Relations with Russia and China after 11 September,”

World Affairs, Vol. 166, No. 1 (SUMMER 2003), pp. 3-23, http://www.jstor.org/stable/20672674, DA 7/19/11]//RS

The most dangerous threats to U.S.-Russia and U.S.-China relations are the disagreements over rogue states and Taiwan. The United States desperately wants to keep Iran, Iraq, and North Korea away from WMD and nuclear technologies, while Russia and China try to promote their economic interests by selling those countries arms and building nuclear reactors there. In a similar manner, the United States sells weapons to Taiwan, which China opposes. Because Iraq, Iran, and North Korea are of such special interest, and because the United States, Russia, and China have such different views on dealing with the rogue states, any further action is likely to aggravate relations. U.S. war against Iraq, U.S. arms sale to Taiwan, Russia's help to build four more nuclear reactors in Iran, or China's sale of materials for making chemical and nuclear weapons to North Korea will likely have negative consequences, similar to those after Kosovo, for bilateral relations. The United States, Russia, and China need to consider the interests of other nations while promoting their own interests. Otherwise, selfish behavior may ruin recent achievements in bilateral cooperation. The crises over North Korea and Iraq are going to be real tests of U.S.-Russia and U.S. China relations. If the countries manage to resolve these issues and further develop relations, it will be evidence that relations have changed substantially since the cold war.

## Internal Link

### No internal link- US-Russia economic relations will always fail- bureaucratic obstacles, corruption, and uneven democratic development in Russia

Good, 6/21 [Allison Good, correspondent for the Times Picayune, “U.S. and Russia are strengthening their relationship, Ambassador says,” June 21, 2011, <http://www.nola.com/business/index.ssf/2011/06/us_and_russia_are_strengthenin.html>, DA 7/18/11]//RS

Beyrle, however, noted that there are still significant obstacles overshadowing the U.S.-Russia economic relationship. "Russia is still a tough place to do business because there are bureaucratic obstacles and corruption is an enormous problem," he continued. "For example, the United States is constantly fighting protectionist lobbies that want to keep American beef and poultry out of Russia." American initiatives to improve trade relations with Russia include working to support Russia's membership in the World Trade Organization. According to Beyrle, this will "allow the United States to benefit from the free movement of goods and services." The United States is also concerned with the uneven democratic development in post-Soviet Russia and popular calls for more governmental accountability. "

## Impact

### No timeframe- Russia has already announced it will maintain its aerospace projects at least through 2015

Augustine Commission, 9 [The Augustine Commission, “Seeking a Human Spaceflight Program Worthy of a Great Nation,” October 2009, Review of US Human Spaceflight Plans Committee, p. 55-56, <http://www.docstoc.com/docs/13564673/Review-of-US-Human-Spaceflight-Plans-Committee---Final-Report>, DA 7/19/11]//RS

Our ISS international partners issued a joint statement at a July 2008 Heads of Agency meeting calling for continuation of ISS operations beyond 2015. Russia has declared publicly that it intends to continue operations after 2015, independent of the U.S., if necessary. NASA believes that this is not technically feasible, but the comment is illustrative of the international reaction to the current ISS plan. Projected lifetime of major International Space Station elements indicating the need for recertifying many elements if the International Space Station is extended to 2020. The commitment to use commercial vehicles for the ISS resupply is one of the more innovative aspects of the current program. The prospect of an ISS resupply market is already stimulating risk-taking industries to develop new launch vehicles and capsules. However, termination of ISS would abruptly end that market in 2015 after fewer than five years of commercial resupply operations. This may not provide enough opportunity for the new industries to grow to maturity, and in some cases would likely threaten the survival of their efforts in this area.

## AT Russia Democracy Scenario

### Turn- Democratization of Russia empirically further destroys our relations and makes the DA terminally nonunique- Our “help” is perceived as antagonistic

Mooney, 5 [Colonel Frederick W. Mooney, “US Russia Policy: Time to Put the Brakes on Democratic Reform,” March 18, 2005, <http://www.dtic.mil/cgi-bin/GetTRDoc?Location=U2&doc=GetTRDoc.pdf&AD=ADA434880>, p. 14, DA 7/19/11]//RS

US/Russia relations have deteriorated since the fall of the Soviet Union in 1991. Much of the antagonism between the two countries has come from US criticism of Russian policies. While some of this criticism was justified by US national interests—the security of nuclear weapons, arms sales, and nuclear assistance to Iran—much was the result of US insensitivity to the Russian situation and impatience with the pace of Russian reform. The Russian people, under the progressive leadership of Mikhael Gorbachev, Boris Yeltsin, and Vladimir Putin, have demonstrated a bold, brave commitment to freedom, democracy and free enterprise, despite lacking the essential ingredients for successful reform. History shows that without these essential ingredients, Russia’s chances of succeeding in this endeavor are not good. History also shows that people need security, both physical and economic, before the luxury of democratic civil liberties. A prosperous middle class, with a stake in a free-market social order, both facilitates democratic reform in autocratic societies and works against reversion to authoritarian rule in democratic societies. President George H. W. Bush understood this, as demonstrated in his policies encouraging evolutionary, vice revolutionary, economic reform in both Poland and China. Russia’s success in implementing reform is vital to US national interests. This paper recommends a new, constructive policy to encourage slower, deliberately planned, evolutionary reform in Russia, focusing on internal security first, then prosperity, then full democratic reform. Without such a measured approach, Russia will surely remain on the brink. Thrice since 1989, it has survived a reversion to authoritarian rule. Russia could very soon find itself in the same situation as Spain in 1936, with a grim choice between communist victory at the polls or nationalist dictatorship, and the real possibility of civil war.

## AT Russian Aerospace good- Authors biased

### Their authors were paid off to portray the program as safe and cooperative to get information out of NASA or its Russian counterpart

Cowing, 2 [Keith Cowing, journalist for NASAWatch, “Space Station Tensions,” American Scientist: Volume 90, p288, May-June 2002, <http://www.jstor.org/stable/27857673>, DA 7/19/11]//RS

But much of that experience was acquired too late to affect the ISS. This is unfortunate, since it contains equipment nearly identical to that used on Mir. Oberg describes in detail the ways in which Russian hardware did not meet the operational and safety specifications of the ISS, standards that NASA regularly waived. As a result, astronauts risk permanent hearing damage from noisy Russian modules, which lack sufficient protection from micrometeoroids and orbital debris. Both sides sought to keep as much detail as possible about the operation of Mir and the tensions of joint tenancy out of the public eye, portraying the program as safe, cooperative and meaningful, although as Oberg chronicles here, it was anything but that. As editor of NASA Watch during this period, I can vouch that this penchant for secrecy bordered on an obsession. Getting information out of NASA or its Russian counterpart was exceedingly difficult.

## AT Russia- Iran Prolif Scenario

### Non unique link- Iranian prolif is inevitable

Gladkyy, 3 [Oleksandr Gladkyy, is an Edmund S. Muskie Fellow in international affairs at Southwest Missouri State University, “American Foreign Policy and U.S. Relations with Russia and China after 11 September,” World Affairs, Vol. 166, No. 1 (SUMMER 2003), pp. 3-23, http://www.jstor.org/stable/20672674, DA 7/19/11]//RS

Russia and Iran. Moscow's provisional agreement with Iran, signed in the 1990s, to help build five nuclear reactors in Iran irritates the United States greatly because the United States strongly believes that Iranians are not just interested in the peaceful use of the atom but are working on a weapons program, too. Therefore, the United States strongly opposes the spread of WMD and nuclear technologies from Russia to U.S. rivals. 99 However, the Russian Federation continues its nuclear assistance to Iran and is currently building a nuclear reactor in Bushehr. Not surprisingly, the United States is pressuring Russia to terminate the project or to take strict measures to contain the proliferation risk. To make matters worse, in August 2002 Russia announced that it had approved a new ten year nuclear cooperation program with Tehran, which would include the building of another nuclear power plant in Ahwaz, one hundred kilometers from the Iraqi border.100 The announcement stunned Washington, coming less than a month after it agreed to a confidence-building $20 billion aid package to help Russia dismantle its weapons of mass destruction. Furthermore, Russia has not stopped the construction of another four reactors, and there is some evidence that "[s]ome Russian specialists are still helping the Iranians obtain the know-how for other parts of the nuclear cycle," said U.S. ambassador to Moscow Alexander Vershbow. Consequently, the United States wants Russia "[t]o crack down more effectively on other transfers of technology to Iran, both for WMD and for ballistic missiles."101 One of Secretary of Defense Donald Rumsfeld's highest priorities has been ending Russian arms and technology sales to states that support terrorism, particularly Iran.102 Similar ly, according to Colin Powell, one of the biggest disagreements between the United States and Russia "[h]as to do with our very strong concern about Russian nuclear weapons and ballistic missile technology that is still finding its way to Iran. Solvency Takeouts No solvency- NASA will not have adequate funds to sustain the plan Hotz, 7/9 [Robert Lee Hotz, correspondent for the Wall Street Journal, “One Last Spin Around the Planet,” July 9, 2011, Wall Street Journal, DA 7/17/11]//RS Despite the celebratory mood surrounding Friday's launch, NASA faces major political and budgetary hurdles in Washington. There is growing bipartisan criticism on Capitol Hill of the agency's leadership, prompted by nagging disputes over the design of next-generation crew capsules and heavy-lift rockets. With the retirement of its shuttles, NASA plans to rely on Russia to transport American astronauts and cargo to the space station until 2016 or so. After that, U.S. commercial space-taxis are slated to take over the job. But there is still no consensus on what technology and manned missions NASA will focus on beyond the space station, particularly to probe deeper into the solar system. As a result, many experts fear there could be a stalemate, in which NASA tries to keep open a variety of options but ends up without adequate funds to aggressively pursue any of them. Lockheed Martin CP In particular, Lockheed Martin has been a leader among the U.S. aerospace industry in developing partnerships with Russia, 8 and "Lockheed Martin's pitch to promote its space partnerships with Russia is based on the need to make the world safer by engaging thousands of highly skilled Russian aerospace engineers and scientists in commercial pursuits, thereby fulfilling cooperative threat reduction objectives. Moreover, because this is being done on a company-to-company basis, there is no expenditure of public funds and the presence of meaningful opportunities to affect real change in the way business is carried out in Russia. . . . This commercial cooperation promotes accountability and adherence to the international export control regimes. Lockheed Martin's business may be more effective than U.S. diplomatic efforts and sanctions in persuading Russia to steer clear of cooperation with rogue countries."

## AT- Russian Aerospace Tradeoff

### NASA has not given Russia aerospace lead- announcement of future projects

Saavedra, 7/10 [Simon Saavedra, Christian Post Correspondent, “NASA After Atlantis: Mars, James Webb Space Telescope,” July 10, 2011, <http://www.christianpost.com/news/nasa-after-atlantis-mars-james-webb-space-telescope-52106/>, DA 7/16/11]//RS

NASA has boldly announced that the end of the shuttle program does not mean the end of NASA or better yet the end of NASA-manned missions to space. The space agency communicated its high ambitions for space explorations, saying it will be "designing and building the capabilities to send humans to explore the solar system, working toward a goal of landing humans on Mars," reads its website. NASA landed a spacecraft named the Mars Pathfinder on Mars in 1997 carrying the Sojourner rover which analyzed Mars' atmosphere, climate and geology. But now, NASA is hoping to land man resembling robots it has developed and has been testing it in order to improve the testing limitations of machines such as rovers. NASA, in cooperation with private companies, will also start building a new space vehicle called the Multi-Purpose Crew Vehicle designed for four astronauts in 21-day missions. NASA has reported that this space vehicle is just part of the next generation fleet it will start using for traveling beyond Low Earth Orbit (LEO). The agency also plans to direction its research in order for it to immediately benefit society such as building greener, quieter and simply better aircrafts or helping create better systems for today's hectic traffic – a move to garner more national interest? Perhaps. With these and other additional projects in development, NASA appears to be running under a full agenda and although it has suffered some setbacks such as the budget cut, it announced its commitment to stay in the lead for space exploration.