Colonization Neg-Wave 1

Table of Contents

Colonization Neg-Wave 1 1

\*\*\* AT: Earth is doomed Advantage \*\*\* 3

AT: Colonization Advantage-Earth is doomed 4

AT: Colonization Impact Calculus 7

AT: Now is critical 8

AT: Overpopulation 9

AT: Yellowstone eruption 10

\*\*\*Colonization Impossible\*\*\* 11

Colonization Not Possible- Laundry List 12

Colonization Not Possible---Procreation 13

Colonization Not Possible---No Tech 17

Colonization Not Possible---Economic Barriers 19

Colonization Not Possible---Economic Feasibility 20

Colonization Not Possible---Travel Times 21

Colonization Not Possible---Health Hazards 23

Colonization Not Possible---Disease 25

Colonization Not Possible---Terraforming Fails 27

Colonization Not Possible---No International Laws 28

Colonization Not Possible---Mars 29

AT: Artificial Gravity---Status Quo Solves 30

AT: Econ Adv- Tech spin-off 31

\*\*\* AT: Leadership Adv \*\*\* 32

Leadership Adv- Alt Cause 33

Leadership Adv- AT: Space Race 34

AT: Aerospace Industry Advantage 35

\*\*\* AT: Helium 3 Adv \*\*\* 37

AT: Helium3 Advantage 37

\*\*\* DA Links \*\*\* 38

Spending/Politics Link---Colonization 38

Politics Link---Colonization---AT: Link Turns 39

\*\*\* Disad Impact Helpers\*\*\* 40

War Turns Space Exploration 40

Nuke War accesses aff Impact calc 41

\*\*\*Prizes CP\*\*\* 43

Prizes CP---1NC 44

Prizes CP---Solves the Case---Moon Colonization 45

Prizes CP---Solves the Case---General 46

Prizes CP---Solves R&D 48

Prizes CP---Private Sector Net-Benefit 49

Prizes CP---AT: Perm---Government Involvement Bad 50

\*\*\* Other CP Ideas \*\*\* 51

Incentives CP Solvency 51

\*\*\* AT: Earth is doomed Advantage \*\*\*

AT: Colonization Advantage-Earth is doomed

Earth is sustainable, and it’s impossible to economically transport a significant number of people without trading off with the resources that enable sustainability

Elhefnawy 9 – Nader Elhefnawy, Professor of English at the University of Miami, writer on IR published in journals including International Security, Astropolitics, and Survival, February 2, 2009, “Planetary demographics and space colonization,” online: http://www.thespacereview.com/article/1296/1

The idea that population growth will drive space expansion is an old one. In 1758, the Danish Reverend Otto Diederich Lutken made reference to the settlement of human beings on other planets as a way to alleviate population pressure in his article, “An enquiry into the proposition that the number of the people is the happiness of the realm, or the greater the number of subjects, the more flourishing the state.” It was also much on the mind of Nikolai Fedorov in his development of his important ideas about space travel. The population explosion of the 20th century and the increased concern about the planet’s ecological limitations have kept these concerns alive and well, figuring prominently in visions like Gerard K. O’Neill’s 1976 book The High Frontier, and a great deal of space opera.

Today the world is still seeing large-scale migrations, but it seems highly unlikely that they will translate into a “push” off-planet, even were the technology to become available in this century as O’Neill (and many others) have predicted. An important reason is that the affluent, technologically advanced states that are most capable of conducting the effort seem least likely to generate space colonists, given their tendency to receive rather than export immigrants in recent decades. This pattern is reinforced by the fact that their populations are aging, and appear to be either stabilizing or gradually declining—not the demographic picture usually associated with such dramatic expansion.

This may suggest that the rich industrialized countries will be the main providers of the money and technology for the enterprise, while the fast-growing developing nations provide a disproportionate share of the colonists, but the facts of the situation are more complex. (O’Neill, certainly, was concerned by the need to redress Third World poverty when he wrote The High Frontier.)

However, even assuming that the cooperation necessary to make this highly unequal arrangement work is somehow achieved, the fact remains that most developing states are actually well along the demographic path already taken by the industrialized nations. The pundits who dismiss Europe’s future on demographic grounds, while celebrating (or dreading) the rise of China, tend to overlook the reality that Europe and China are in the same boat with regard to family sizes. The Total Fertility Rate (TFR)> for the People’s Republic of China is actually 1.77 births per woman, well below the replacement level of 2.1, and slightly below Norway’s. (The trend is even more marked among the “overseas” Chinese: the four countries with the lowest TFRs in the world being Hong Kong, Macao, Singapore and Taiwan, respectively.) While countries like the Philippines have higher fertility rates, a similar drop is already evident in several other developing East Asian countries (Burma, Thailand, Vietnam), as well as industrialized Korea and Japan.

The same trends are evident in the Middle East as well, contrary to what some sectors of the media proclaim. In Turkey, Algeria, Tunisia, Lebanon and Iran, in fact, birth rates have already fallen below replacement level, with fundamentalist Iran’s 1.7 children per woman below the levels of Finland, Denmark, Luxembourg and France.

The trends are less advanced in southern Asia, but still evident there too, with India’s TFR at 2.8 and Bangladesh’s at 3.0. Pakistan’s is 3.6, relatively high, but also representing a sustained drop from nearly twice that in the early 1960s, and likely to fall to 2.3 by 2025 according to a United Nations study. (In the same time frame, India’s birth rate is likely to fall to replacement levels, or very close to them.)

The situation is similar in the Western hemisphere, and not only in the United States and Canada. While fertility remains relatively high in Central America (Guatemala’s TFR is 3.6 births per woman), these countries still represent a relatively small share of the population of the region as a whole. In populous Brazil, by contrast, births have fallen to fewer than two per woman, and the same goes for Uruguay, with Argentina not far behind. Cuba’s TFR is among the lowest in the world at 1.6. Even in Mexico, the source of so much consternation in the United States, the figure is under 2.4 and dropping.

In short, very high fertility rates have become a thing of the past outside sub-Saharan Africa, and even there the likelihood is that development will mean this changes here as well. Of course, that leaves the possibility of population growth from the other end of the telescope: greater longevity, but the prospects for this also seem to have been exaggerated. For American women, life expectancy improved from 47 years in 1900, to 71 years in 1950—a 50 percent increase in that half-century. From 1950 to 2000, this was extended by another eight to ten years, a much more modest 10–15 percent growth in the same length of time. (The profile of male life expectancy in the US followed a similar course.)

This is a broad slowdown in the extension of the human life span, despite the skyrocketing cost of health care. Accordingly, just going by the established trends, life is unlikely to get very much longer in the foreseeable future. Indeed, there are signs that this progress is being reversed, with smoking and obesity commonly attacked as the culprits. Of course, there are those who predict revolutionary advances in medicine which will radically extend life and health in the near future, and perhaps even eliminate death, but there has been little in the way of tangible results to support such promises.

Because of these trends, where global population nearly quadrupled in the last century, it may actually crest and start to drop by the middle of this one. Of course, none of this is to dismiss claims that the world faces serious population stresses, or to argue that even slower population growth would not be desirable. According to the Worldwatch Institute, the world economy was already consuming the resources of 1.2 Earths by 1999, a figure that had risen to 1.4 Earths by this year. The addition of two to three billion people in the coming decades as the drop in population growth catches up with the drop in fertility rates, as well as the struggle to give billions more of those already here a decent life, will increase it (all other things being equal). The fact that the increase will overwhelmingly occur in the poorest countries also poses important challenges.

Of course, it may seem a world of nine billion people or more on a planet facing ecological degradation and resource crunches will still suffice to drive a torrent of settlers out to the rest of the solar system. However, the same economic constraints discussed above would preclude that. Even were space settlement to appear an attractive palliative under those circumstances, it seems unlikely that a really struggling planetary economy would be up to the job of delivering demographically significant numbers of people to new homes in orbit and beyond and equipping them to live off the resources in space, rather than depending on Earth’s limited stock of them.

In other words, the motivation would exist, but not the means, and the opposite also seems to be true: that a world economy capable of building habitable space colonies is likely to be one significantly more prosperous than that of today, rather than poorer. For that reason, life would probably be more comfortable for most of the planet’s inhabitants rather than less, diminishing the “push” factor that has historically been so important in such movements in the past. (That this population would on the whole be older—and in that, hardly the demographic profile of a pioneering culture—should also be noted in such a consideration.) This may mean that, as writers like Hans Moravec and Ray Kurzweil have suggested, it is not human beings, but the robotic “mind children” of humanity, that will leave the Earth to explore the universe beyond it, with the vast majority of the flesh-and-blood humans sitting out the adventure at home.

Space exploration will cause environmental exploitation, nuclear-powered arms races, and epidemics.

Gagnon 99 (Bruce K., Coordinator of the Global Network Against Weapons & Nuclear Power in Space, “Space Exploration and Exploitation,” http://www.space4peace.org/articles/scandm.htm) hss

We are now poised to take the bad seed of greed, environmental exploitation and war into space. Having shown such enormous disregard for our own planet Earth, the so-called "visionaries" and "explorers" are now ready to rape and pillage the heavens. Countless launches of nuclear materials, using rockets that regularly blow up on the launch pad, will seriously jeopardize life on Earth. Returning potentially bacteria-laden space materials back to Earth, without any real plans for containment and monitoring, could create new epidemics for us. The possibility of an expanding nuclear-powered arms race in space will certainly have serious ecological and political ramifications as well. The effort to deny years of consensus around international space law will create new global conflicts and confrontations.

We will just destroy our new environment in space – should focus on fixing Earth

Williams 2010. (Lynda Williams is a professor at Santa Rosa Junior College. “Irrational Dreams of Space Colonization” Peace Review, a Journal of Social Justice The New Arms Race in Outer Space (22.1, Spring 2010) http://www.scientainment.com/lwilliams\_peacereview.pdf) hss

The private development of space is growing at a flurried rate. Competitions such as the X-Prize for companies to reach orbit and the Google Prize to land a robot on the Moon has launched space wanderlust in citizens throughout the country who dream of traveling to space. The reality is that there are few protections for the environment and the passengers of these flights of fancy. The FAA, which regulates space launches, is under a Congressional mandate to foster the industry. It is difficult if not impossible to have objective regulation of an industry when it enjoys government incentives to profit. We have much to determine on planet Earth before we launch willy nilly into another race into space and a potential environmental disaster and arms race in outer space. If we direct our intellectual and technological resources toward space exploration without consideration of the environmental and political consequences, what is left behind in the wake? The hype surrounding space exploration leaves a dangerous vacuum in the collective consciousness of solving the problems on Earth. If we accept the inevitability of Earth’s destruction and its biosphere, we are left looking toward the heavens for our solutions and resolution. Young scientists, rather than working on serious environmental challenges on Earth, dream of Moon or Martian bases to save humanity, fueling the prophesy of our planetary destruction, rather than working on solutions to solve the problems on Earth. Every space faring entity, be they governmental or corporate, face the same challenges. Star Trek emboldened us all to dream of space, the final frontier. The reality is that our planet Earth is a perfect spaceship. We travel around our star the sun once every year, and the sun pull us with her gravitational force around the galaxy once every 250 million years through star systems, star clusters and all the possible exosolar planets that may host life or be habitable for us to colonize. The sun will be around for billions of years and we have ample time to explore the stars. It woukd be wise and prudent for us as a species to focus our intellectual and technological knowledge now into preserving our spaceship for the long voyage through the stars, so that once we have figured out how to make life on Earth work in an environmentally and politically sustainable way, we can then venture off the planet into the final frontier of our dreams.

No brink to their extinction claims.

Shapiro 07 (Robert, staff writer for The Space Review, “Why the moon? Human survival!”, http://www.thespacereview.com/article/832/1) hss

Of course, we have been hearing predictions of Doomsday for years, and we are still here. According to geologists, the eruption of Mt. Toba in Indonesia 71,000 years ago darkened the sky for years. The event caused killed much of plant life on the planet. The famine that resulted caused a severe drop in the human population of that time. The Black Death of the 14th century killed perhaps one-third of the population of Europe and the great flu epidemic of 1918 claimed an estimated 40 million victims. Despite these disasters, and others such as global wars, humanity has muddled through and even prospered. Why should things be different now?

Colonizing space is an extreme way to “get off the rock”- not necessary.

Shapiro 07 (Robert, staff writer for The Space Review,“Why the moon? Human survival!”, http://www.thespacereview.com/article/832/1) hss

Physicist Stephen Hawking, and a number of others, have called for humanity to spread out to distant planets of our Solar System. But there is no need to go so far to protect ourselves. After a few decades—centuries at worst—dust and ash will settle, radioactive materials will decay, and viruses will perish. Earth will once again become the best home for humanity in the Solar System. Return would be easiest if a safe sanctuary were nearby. In the more probable instance that only a limited disaster took place, that nearby sanctuary could also play a valuable role in restoring lost data and cultural materials, and coordinating the recovery. And of course, construction of the rescue base will be much easier if it is only days, rather than months or years, away.

AT: Colonization Impact Calculus

Problems at hand come first-We have is no responsibility to care about what happens in the far future

**Stross 7** (Charles Stross, Freelance Journalist and Writer, “The High Frontier-Redux”, http://www.antipope.org/charlie/blog-static/2007/06/the-high-frontier-redux.html)

And I don't want to spend much time talking about the unspoken ideological underpinnings of the urge to space colonization, other than to point out that they're there, that the case for space colonization isn't usually presented as an economic enterprise so much as a quasi-religious one. "We can't afford to keep all our eggs in one basket" isn't so much a justification as an appeal to sentimentality, for in the hypothetical case of a planet-trashing catastrophe, we (who currently inhabit the surface of the Earth) are dead anyway. The future extinction of the human species cannot affect you if you are already dead: strictly speaking, it should be of no personal concern.

AT: Now is critical

Space colonization wouldn’t work and now isn’t the right time to colonize

Williams 2010. (Lynda Williams is a professor at Santa Rosa Junior College. “Irrational Dreams of Space Colonization” Peace Review, a Journal of Social Justice The New Arms Race in Outer Space (22.1, Spring 2010) http://www.scientainment.com/lwilliams\_peacereview.pdf) hss

According to scientific theory, the destruction of Earth is a certainty. About five billion years from now, when our sun exhausts its nuclear fuel, it will expand in size and envelope the inner planets, including the Earth, and burn them into oblivion. So yes, we are doomed, but we have 5 billion years, plus or minus a few hund red million, to plan our extraterrestrial escape. The need to colonize the Moon or Mars to guarantee our survival based on this fact is not pressing. There are also real risks due to collisions with asteroids and comets, though none are of immediate threat and do not necessitate extraterrestrial colonization. There are many Earth-based technological strategies that can be developed in time to mediate such astronomical threats such as gravitational tugboats that drag the objects out of range. The solar system could also potentially be exposed to galactic sources of high-energy gamma ray bursts that could fry all life on Earth, but any Moon or Mars base would face a similar fate. Thus, Moon or Mars human based colonies would not protect us from any of these astronomical threats in the near future. Life on Earth is more urgently threatened by the destruction of the biosphere and its life sustaining habitat due environmental catastrophes such as climate change, ocean acidification, disruption of the food chain, bio-warfare, nuclear war, nuclear winter, and myriads of other man- made doomsday prophesies. If we accept these threats as inevitabilities on par with real astronomical dangers and divert our natural, intellectual, political and technological resources from solving these problems into escaping them, will we playing into a self- fulfilling prophesy of our own planetary doom? Seeking space based solutions to our Earthly problems may indeed exacerbate the planetary threats we face. This is the core of the ethical dilemma posed by space colonization: should we put our recourses and bets on developing human colonies on other worlds to survive natural and man-made catastrophes or should we focus all of our energies on solving the problems that create these threats on Earth?

AT: Overpopulation

Overpopulation Not an Issue

Heather Horn, Columnist – The Atlantic Wire

March 15, 2010

(http://www.theatlanticwire.com/global/2010/03/there-is-no-overpopulation-problem/20057/) “There Is No Overpopulation Problem”

"Many of today's most-respected thinkers, from Stephen Hawking to David Attenborough, argue that our efforts to fight climate change and other environmental perils will all fail unless we 'do something' about population growth." This, says Fred Pearce frankly, "is nonsense." Far from surging out of control, population growth is actually slowing, he says. Writing in the British magazine Prospect, Pearce argues that the Western preoccupation with the overpopulation issue isn't just silly, it's hypocritical:

In fact, rising consumption today far outstrips the rising headcount as a threat to the planet. And most of the extra consumption has been in rich countries that have long since given up adding substantial numbers to their population, while most of the remaining population growth is in countries with a very small impact on the planet. By almost any measure you choose, a small proportion of the world’s people take the majority of the world’s resources and produce the majority of its pollution.

In other words, argues Pearce, focus on the population "problem" is essentially a matter of the rich "downplay[ing] the importance of our own environmental footprint because future generations of poor people might one day have the temerity to get as rich and destructive as us." He's not making any exceptions in his condemnation: "Some green activists need to take a long hard look at themselves."

AT: Yellowstone eruption

Yellowstone not erupting anytime soon

Jake Lowenstern, USGS Scientist in Charge of Yellowstone Volcano Observatory

April 16, 2009

(http://geology.com/usgs/yellowstone-volcano/) “The Volcano Beneath Yellowstone”

How Active is the Yellowstone Volcano?

The Yellowstone Volcano Observatory closely monitors earthquake activity, ground deformation, streamflow and stream temperatures in the Yellowstone area. Occasional earthquake swarms occur, the ground surface changes elevation and streams change in both discharge amount and temperature. They have no evidence to suggest that a volcanic eruption of any size will happen at Yellowstone in the forseeable future.

When Was the Last Yellowstone Eruption?

The most recent volcanic eruption at Yellowstone occurred about 70,000 years ago and produced the lava flows of the Pitchstone Plateau. The lava flows of this eruption covered an area about the size of Washington, D.C. and are up to 100 feet thick.

\*\*\*Colonization Impossible\*\*\*

Colonization Not Possible- Laundry List

No benefit to space colonization- SQUO threats outweigh, no threat of extinction, no habitable celestial bodies, infertile babies, muscle and bone degradation, no funding, and no decrease in risk of extinction.

The Hard SF 7 (articles focusing on delineating science from science fiction, 5-10-7, “Can Space Colonization Guarantee Human Survival?”, **http://www.hardsf.org/IssuSpac.htm**) OP

Can Space Colonization Guarantee Human Survival? Many people have argued that as long as humans live only on Earth, we have "all our eggs in one basket". They suggest we need space colonies to insure the future of the species. There are many current and potential threats to the human race. However, considering the human source of many of the threats and the timescales involved, I'm not sure that space colonization should be the top priority in preempting those threats. Timescales To consider how well space colonization is likely to solve our problems we need to ask what the timescales of sustainable, independent space colonies are. If, after disaster strikes Earth, Earth is still able to supplement the needs of space colonies, then those space colonies aren't necessarily essential to continuing the human race. We have to ask when spaces colonies would be functioning without need of any assistance from Earth. Truly independent space colonies must not simply provide bare nutrition, air, heat, and habitat repair for 100 years. They should have a non-traumatizing environment with enough people to protect against dangerous levels of inbreeding – able to last and progress indefinitely. There will also be a minimum number of people required for any space colony in order to provide needed manpower in various occupations (one person with multiple occupations doesn’t help if you need two of those occupations in different places at the same time). How does that compare to the timescales of threats from climate change, environmental crisis, nuclear / bio weapons and accidents, possible nanotech weapons or accidents, overpopulation, etc.? We also have to consider threats to the global economy, since an economic collapse would presumably at least interrupt efforts towards establishing space colonies. Economic crises also increase risks of war, which could have apocalyptic consequences. Even assuming the ultimate solution of human survival is space colonization, we may need to find a way to extend the lifespan of human civilization and economy on Earth in order to have time to accomplish sustainable space colonization. Consider the possible habitats. Space stations in orbit around Earth or at L5 have little natural resources at their location other than solar energy. The Moon has no atmosphere, a limited amount of water at best, which part of the Moon has access to solar energy varies during the month, and it's not considered one of the solar system's better sources of minerals. Venus is extremely hot, the atmosphere is dangerous and with the cloud cover I'm not sure how practical solar energy would be at the surface. Mars has too little atmosphere and accessible water is questionable, etc. Some of the outer planet's moons may have enough ice and raw materials, but are very cold, lack usable atmospheres and get limited solar energy. And so on. We may be able to establish bases at some of these places in a realistically short amount of time, but not independent ones. Any colony that wants to get resources from post-apocalyptic Earth will need to have spaceships that can land on Earth and later achieve escape velocity from Earth while carrying cargo without help from Earth. Otherwise, the needed resources may not be available from a single astronomical body. That could require longer distance travel between bodies - whether that's between asteroids, between moons, between planets or some other combination. Significant space travel ability may be essential. A colony would need an industrial base capable of extracting and refining raw materials, and making useful things from them. Interstellar colonies and terraforming of planets in our solar system are longer range goals. Colonies in any place other than an Earth-like planet will require a substantial infrastructure to allow humans to exist in an otherwise deadly environment. The colony needs to be able to maintain and repair that infrastructure... There is a significant difference between an enormous disaster on Earth and one at any space colony we can expect for at least a century. Even something on the scale of a "dinosaur killer" asteroid impact won't necessarily kill all humans on Earth. (However, if the world economy / technology is setback too much it may not be possible to re-achieve a hi-tech civilization. We've extracted most minerals / fossil fuels that can be gotten without hi-tech, a post-disaster society may be left unable to get these.) It will be a long time before an independent space colony could grow to the point some of its people could survive after a major disaster. Meanwhile, we have not yet solved the physical and psychological problems that develop during months of low gravity. Most of the physical issues may not be significant for those who never intend to return to Earth-type gravities. Psychological issues remain. Some physical issues may arise when dealing with years and decades in low gravity. Even in shorter spans of time, weakening bones may have serious consequences in low gravity situations. Weakened hip bones may be a problem for women giving birth in low gravity. Other stressful activities may also be problematic. We need to find out how low gravity will effect a fetus during pregnancy and child growth afterwards. Identifying and resolving all the issues is likely to take many years. Currently, our society is not inclined to invest that much in either stopping global warming (and other threats) or space habitats. It strikes me as improbable that we will see a heavy investment in both of them at the same time in the next period of time. My impression is the best chance for human survival is focusing as much as possible on one or the other of the two paths, and that space colonization will not solve the problem within the limited time-frame. Of course, if governments refuse to fund solutions to the environmental crisis, but budget money for space habitats we should use that money. Hopefully, governments will respond to the crisis before it’s too late and the problems will be brought under control and within safe limits. Then there will be no reason not to expand out into the universe. Postscript For those who still believe space colonization should be the priority, I would like to suggest one piece of advice. The known threats to human survival in the next century or so are not vast earthquakes and volcanoes, asteroid impacts, supernovas or other natural disasters. Most of them are at least partly man-made. If the same problems are not to threaten survival of humans on space colonies, we either have to make humans on Earth act more responsibly to ensure survival before we colonize, or we need to know how to insure that those people who colonize are not so prone to make the same mistakes their Earthly brothers do. If space colonization ends up amounting to running away from our problems, we will not have changed the odds of human survival by much. Space colonies would need to be planned in a way to avoid this fate.

Colonization Not Possible---Procreation

Colonization is not possible-Infertility

**Walker 11** (James Walker, Writer at gear Fuse, “Infertility Concerns May Leave Space Colonization Hopes Barren”, http://www.gearfuse.com/infertility-concerns-may-leave-space-colonization-hopes-barren/, 2/14/2011)

According to NASA Ames Chief Life Scientist Tore Straume (seen left with a villainous goatee), the radiation generated by cosmic rays and solar flares will make it difficult to conceive during interplanetary travel. Moreover, any child conceived during spaceflight could become sterilized due to the radiation. This conclusion is based on multiple studies conducted on “non-human primates” (read: “monkeys”) that were given doses of radiation and saw that the eggs of female fetuses began to die off during the second half of pregnancy, resulting in a sterile female when the fetus is finally birthed. Straume says, “One would have to be very protective of those cells during gestation, during pregnancy, to make sure that the female didn’t become sterile so they could continue the colony.” Similar problems could be seen in men, with the radiation damaging the male’s sperm. It’s also believed that in addition to the sterilization issues, other mental and physical defects could result from the radiation’s effects on a fetus.

Can’t reproduce in space- gravity kills sperm.

Lippi 08 (Giuseppe, professor and surgeon at the University of Verona, “Abolishing the Law of Gravity,” Canadian Medical Association Journal, http://www.cmaj.ca/cgi/content/full/178/5/598) hss

As the International Space Station moves us closer to the possibilityof colonizing space, it is becoming increasingly important tounderstand the effects of altered gravity on mammalian reproductivephysiology. There is evidence that hypo- and hyper-gravity induce changes in male and female reproductive processes.[2](http://www.cmaj.ca/cgi/content/full/178/5/598#R2-29) Findings from studies using a variety of experimental conditions to simulatehypogravity raise questions about whether reproduction is possible when gravity is reduced. Studies using the Holton hindlimb suspension model, which providesa practical way to simulate the major physiologic effects ofhypogravity, are providing evidence that hypogravity might exert pronounced effects on male reproductive processes and reduce the rate of implantation during early pregnancy in rats. Moreover,the cardiovascular deconditioning, bone demineralization and decrease in red blood cell concentration associated with hypogravity might affect the ability of female rats to sustain their pregnancies. Similar findings from experiments during space flights raise questions about whether early pregnancy can be sustained in humans when gravity is reduced.[2](http://www.cmaj.ca/cgi/content/full/178/5/598#R2-29) Additional research is neededto fill in the gaps in our knowledge about reproductive physiologyunder conditions of hypo- and micro-gravity.

Even low doses of ionization are enough to sterilize female fetuses.

Minkel 11 (J.R., writer for Space.com, “Love is in the air, but in space, it's a little risky”, 2-11-11, http://www.msnbc.msn.com/id/41537193/ns/technology\_and\_science-space/t/love-air-space-its-little-risky/) OP

One hazard comes from solar flares, which spew energetic protons across the solar system. Although the timing and intensity of such outbursts is difficult to predict in advance, these particles would be relatively easy to shield against, Straume told Space.com. "A few centimeters of a material can knock them way down in intensity to acceptable levels," Straume said. Posing a tougher problem would be radiation streaming in from outside the solar system. So-called galactic cosmic rays consist largely of very high-energy protons, but they also include charged atomic nuclei running up the periodic table all the way to iron, which is quite heavy, atomically speaking. Such charged particles can blow apart biological molecules such as DNA and would easily rip through the aluminum shielding of a spacecraft traveling through interplanetary space. Researchers' understanding of the reproductive hazards of ionizing radiation come primarily from sudden exposures such as radiotherapy for cancer and atomic bomb blasts. However, studies in nonhuman primates have found that even relatively low doses of ionizing radiation are sufficient to kill most of the immature oocytes, or egg cells, in a female fetus during the second half of pregnancy. If those results apply to people as well, then a girl conceived in interplanetary space might well be born sterile because of damage to her eggs. "One would have to be very protective of those cells during gestation, during pregnancy, to make sure that the female didn't become sterile so they could continue the colony," Straume said.

Space babies conceived in space are more likely to have mental defects.

Minkel 11 (J.R., writer for Space.com, “Love is in the air, but in space, it's a little risky”, 2-11-11, http://www.msnbc.msn.com/id/41537193/ns/technology\_and\_science-space/t/love-air-space-its-little-risky/) OP

Space pregnancies are risky A child conceived in space would also be likely to suffer from other problems as well. Cells divide and differentiate very rapidly during gestation, and damage to a single cell destined to become the brain or another organ could easily be amplified. Straume said the dose of radiation received by a fetus on a trip to Mars could likely result in severe mental retardation or other deficits. Similar problems could result from damage to sperm, said radiation biologist and geneticist Andrew Wyrobek of Lawrence Berkeley National Laboratory, who was not part of the study. Although the effects of chronic space radiation are unclear, low doses of radiation can kill or damage sperm, which might render a man infertile or lead to birth defects. And in rodents, radiation damage can affect offspring born long after the initial exposure to their fathers. "We know that ionizing radiation can induce permanent genetic damage in stem cells" – the cells from which sperm arise, Wyrobek said

All space babies are sterile, ending the human race.

The Week Magazine 11 (**http://theweek.com/article/index/212267/why-humans-will-never-colonize-space**) OP

Why couldn't humans colonize space? Because any child conceived and born in space is likely to be born sterile. Scientists at NASA say that the high levels of radiation in space would kill any female fetus' lifetime supply of eggs, while males in the womb would likely become sterile. The child could also suffer "mental and physical defects" from exposure to harmful radiation.

Space babies are infertile.

London Independent. February 14, 2011. (http://www.independent.co.uk/news/science/why-infertility-will-stop-humans-colonising-space-2213861.html) hss

The prospect of long-term space travel has led scientists to consider, increasingly seriously, the following conundrum: if travelling to a new home might take thousands of years, would humans be able to successfully procreate along the way? The early indications from Nasa are not encouraging. Space, it seems, is simply not a good place to have sex. According to a review by three scientists looking into the feasibility of colonising Mars, astronauts would be well advised to avoid getting pregnant along the way because of the high levels of radiation that would bombard their bodies as they travelled through space. Without effective shielding on spaceships, high-energy proton particles would probably sterilise any female foetus conceived in deep space and could have a profound effect on male fertility. "The present shielding capabilities would probably preclude having a pregnancy transited to Mars," said radiation biophysicist Tore Straume of Nasa's Ames Research Center in an essay for the Journal of Cosmology. The DNA which guides the development of all the cells in the body is easily damaged by the kind of radiation that would assail astronauts as they journeyed through space. Studies on non-human primates have shown that exposure to ionising radiation kills egg cells in a female foetus during the second half of pregnancy. "One would have to be very protective of those cells during gestation, during pregnancy, to make sure that the female didn't become sterile so they could continue the colony," Dr Straume said. Radiation in space comes from numerous sources but the two types that have Nasa scientists most concerned are solar flares and galactic cosmic rays. Flares are the result of huge explosions in the Sun's atmosphere that catapult highly charged protons across space. The Earth's atmosphere and magnetic field absorbs much of this harmful radiation – but in space astronauts are much more vulnerable. Galactic cosmic rays pose an even greater threat. They are made up of even heavier charged particles. Although Nasa's shields can protect astronauts against most flare radiation, it is unlikely they could do the same against cosmic rays. Until recently, sex had been a taboo subject for Nasa, which has a strict code of conduct stating that "relationships of trust" among astronauts are to be maintained at all times. Only once has a husband and wife been on the same mission – Jan Davis and Mark Lee – and they have remained tight-lipped over whether they joined the 62-mile high club.

Sex in space could prove to be very dangerous  
Bacal 2009.(Kira Bacal has a MD, PhD, and MPH. “Sex in space taken seriously” http://philosophyofscienceportal.blogspot.com/2009/01/sex-in-space-taken-seriously.html) hss

Performance of the sex act in an extraterrestrial environment will require potentially complex mechanics.[9-12] Past generations of motivated humans have been able to overcome similar challenges relating to issues of geometry and access, whether posed by chastity belts, the backseats of compact cars, or airplane lavatories. It is thus unlikely that logistical issues of the extraterrestrial environment will prove insurmountable. However, serious questions remain. For example, what impact will an in-flight sexual relationship have on team dynamics and efficiency? What are the chances of a successful pregnancy and delivery? Is the risk of STD transmission higher or lower in space? What about the risk of ectopic pregnancy, miscarriage, or other complications? As life developed and spread across the Earth, humans adapted to a wide range of climates, altitudes, diets, and habitats. Yet there were absolutes throughout this period: gravity, radiation (or lack thereof), atmospheric composition, and a relatively narrow band of temperature and ambient pressure. As we move beyond the atmosphere, however, these parameters change abruptly. Can millions of years of evolution keep pace and permit reproduction to occur in such a different environment? If human life is not able to reproduce itself away from our home planet, what will be the implications for our space programs and long-term goals? If and when sexual relationships within a space crew become acknowledged, the medical system will have to reflect this. It will need to be augmented to reflect the increased medical risks created by sexual activity. Unfortunately, the previous medical system designs have deliberately not included planning for such conditions. Diagnostic and therapeutic capabilities will now need to reflect all the possible conditions, ranging from STD to pregnancy and its potential complications, as well as the increased risk of interpersonal conflicts arising from the more complicated relationships. Training for both ground and flight crews will also need to be adapted to address these issues. Furthermore, in case of pregnancy, although the amount of research on this topic has been limited,[13] many studies suggest that the space environment may have significant and deleterious effects on a developing fetus.

Long amounts of time in space leads to psychosocial problems

Bacal 2009.(Kira Bacal has a MD, PhD, and MPH. “Sex in space taken seriously” http://philosophyofscienceportal.blogspot.com/2009/01/sex-in-space-taken-seriously.html) hss

The psychosocial implications of in-flight sex and reproduction are at least as problematic as the related physiological challenges. For the foreseeable future, space crews will be relatively small in number. If pairing off occurs within the crew, it can have serious ramifications on the crew's working relationships, and therefore, on mission success and crew operations.[4,11,14,15] Former astronaut Norman Thaggard commented, "[Issues associated with romantic relationships are] just one more problem that can potentially cause the whole thing to come apart."[4] As we have seen in recent years, even professional astronauts on active flight status can develop serious mental health issues related to interpersonal relationships,[2,16] and the extreme, prolonged stressors of the long-duration spaceflight environment will only make such situations worse.[4] Previous long-duration missions have demonstrated that minor nuisances can lead to huge conflicts, and the addition of sexual tension will create even more challenges for the crew.[17] The limited social networks can lead to problems, such as privacy issues, the odd man out, and triangles.[15] Break-ups, which must be considered an inevitable corollary to romantic pairings, can further contribute to widespread inter-personal conflicts.[11,17] Behavioral health has long been recognized as a major challenge to long-duration spaceflight.[17-20] An International Space Station astronaut Dan Bursch commented, "Most of the challenges are more mental and psychological." In this, he echoed the earlier sentiments of cosmonaut Valerie Ryumin, "All one needs to effect a murder is lock two men into a cabin, 18 ft by 20 ft, and keep them there for two months.[17]" How much more challenging will it be to maintain crew performance and healthy interpersonal relationships when the group becomes coeducational, semi-permanent, and sexually involved?

Babies and children in space would have many different development problems.

Bacal 2009.(Kira Bacal has a MD, PhD, and MPH. “Sex in space taken seriously” http://philosophyofscienceportal.blogspot.com/2009/01/sex-in-space-taken-seriously.html) hss

Astronauts and rats exposed to microgravity have experienced endocrine imbalances, such as hypothyroidism.[52] Such abnormalities in a pregnant woman can have significant effects on the fetus. For example, cerebellar development is regulated by thyroid hormones, and deficiencies in the neonatal brain can lead to cretinism and other abnormalities.[52] By contrast, other studies have suggested that spaceflight initiated during the post-implantation phase of pregnancy does not affect ovarian-hypophyseal function in rats.[53] Of particular concern are findings that exposure to spaceflight at certain times and for certain durations in young, postnatal rats led to long-term problems in their motor function.[54,55] This is consistent with well-established notions of "critical developmental periods," during which specific events are required for the normal development of certain systems.[50,55] If these events (such as exposure to a 1G field) do not occur, irreversible, long-term deficits may result. This suggests that even after birth, an infant's normal growth and development can be profoundly affected by the space environment. Similarly, other research suggests that interactions between rat mothers and their neonatal offspring are altered in the space environment,[27] which may also lead to suboptimal development. Unfortunately, there has been very little research on development after birth in microgravity,[25] and a great deal more will be required.[56]

Colonization Not Possible---No Tech

No Colonization-Tech

A. High Transportation Costs

**Woodcock 11** (Gordon R. Woodcock, Published over 100 Space Exploration books, On the NASA Advisory Board, Executive Vice President of the National Space Society, “NSS Roadmap: Technological Barriers to Space Settlement”, http://www.nss.org/settlement/roadmap/technological.html, 4/24/2011)

Lack of Affordable Transportation to Space: It's very costly today. Launching a pound of payload into space on the shuttle costs about $10,000; a typical expendable launch vehicle (ELV) charges about $5,000, and the cheapest ELV prices are about $3,000. If the shuttle were converted by putting a passenger cabin in the payload bay, it could carry about 50 passengers. At a launch cost of some $400 million, the ticket price would be at least $8 million. Only the wealthiest can afford such a price and few would choose to; at this price it is unlikely even one such excursion would ever get off the ground. Pundits and technologists have been promising that low cost space transportation is "just around the corner" for at least forty years. Shuttle was supposed to be low cost. So what's the story, really? When we watch a shuttle launch, it appears a prodigious amount of energy is being used. So much that cost simply can't come down a lot? The energy is not really that great; it is just released very rapidly. The theoretical energy of an object in orbit is about 4 kilowatt hours per pound. At typical retail energy cost of 10¢ per kWh, the result is 40¢ per pound. So why are we paying $5,000/lb? Are we doing something fundamentally wrong? Probably, but we don't know of a practical way to get to space except by rocket propulsion. We know the cost of operating a mature-industry transportation system (like motor vehicles or air transport) is about four to five times the underlying cost of the energy used. Figure it for a typical car: the gas costs about 6¢ per mile and total cost to run a car is about 30¢ per mile. Since we can't have low cost by continuing to throw away expensive aerospace hardware on every launch, let's consider the actual energy cost for reusable launch vehicles (RLVs). For a typical propellant load of hydrogen and oxygen, the cost is about $10/lb of payload. Applying 5 x energy cost as earlier, we expect $50/lb for a mature space transportation industry using RLVs. Evidently this isn't a mature industry. Why not? Because demand is too small compared to the large investments needed to develop an RLV and field a fleet of three or more vehicles. Paying off these investments means that RLVs are more cost-effective than ELVs only at traffic demand of 100 missions per year or more. Current worldwide demand is 20 to 40. The most comparable industry, commercial aviation, experiences demand of millions of flights per year. Calculations show that RLVs could approach the "mature industry" cost projection at a demand level of "only" thousands per year. If demand should grow to such numbers, a successful RLV must have certain other attributes: Turnaround time on the ground one or two days, low probability of loss, and vehicle life of more than 1,000 total flights. Two graphs illustrate: the first shows effects of traffic demand and vehicle flight rate (the latter dictated by turnaround time), and the second shows potential for cost reduction with all attributes selected to define a "successful RLV." Without high demand, the RLV business case does not close no matter how good the RLV's other attributes. Clearly, if space settlement were undertaken, traffic demand would be very large. However, without significant reduction in costs, a settlement program is seen as economically impossible. It's a "Catch-22." Government-funded human exploration supported by RLVs would improve the business case, but probably not enough for private investment: A modest lunar base needs about 25 launches/year to support four lunar trips per year. Mars exploration, assuming one trip per Mars opportunity, needs about 50 per year to put up enough equipment and propellant, and support orbital assembly operations. Other NASA demands are about 10 per year, and commercial communications, up to 20 per year. The projected total demand is about 100 launches/year, and the industry's revenue at NASA's target cost of $1,000/lb would be about $4 billion annually. That's actually a little less revenue than today. Investors and company boards will ask, "Why take high business risk if revenue doesn't grow even with success?"

B. Dependence on ELV’s

**Woodcock 11** (Gordon R. Woodcock, Published over 100 Space Exploration books, On the NASA Advisory Board, Executive Vice President of the National Space Society, “NSS Roadmap: Technological Barriers to Space Settlement”, http://www.nss.org/settlement/roadmap/technological.html, 4/24/2011)

Poor Safety Record for Launch Vehicles: This is the second barrier. Quite simply, it follows from the fact that launch vehicles evolved from military rockets, for which a reliability of 0.95 is good enough. A successful RLV, especially if it is to carry passengers, needs to evolve from the aviation tradition. It needs a fatality accident (loss) probability at least as low as one in a hundred thousand. Commercial jetliners today are about 1 in 10 million. My guess at how such an RLV would operate gives safety of flight the highest design priority. Preferably no staging events, i.e., single-stage-to-orbit. Horizontal takeoff and landing with refused takeoff capability. No in-flight engine starts unless the plane can fly back to safe landing in case of failure. Safe abort from anywhere in the trajectory with an engine out. A small number of engines. The safety optimum is 2 to 4 as for jet aircraft. Finally, redundant flight controls. Most of this comes straight out of federal air regulations for commercial jetliners. The technical challenges to achieve these attributes are daunting, and may take time. How does NASA's space launch initiative (SLI) fit into this picture? It is supposed to be paving the way for low cost and safe space transportation. NASA is anxious to show its RLV requirements "converge" with those of the commercial world. If true, NASA believes commercial investors would put up a large share of the money for RLV development. I believe commercial motivation to replace the new generation of satellite launchers just now coming into service is nil. Atlas III, Sea Launch and Delta III have had a couple of launches. Delta IV and Atlas V are yet to fly. These systems are mostly privately financed. Their investment has not been paid out. Replacing them with a lower-priced RLV is bad business. If prices are reduced, revenue is reduced.

C. No Closed-Loop Life Support System

**Woodcock 11** (Gordon R. Woodcock, Published over 100 Space Exploration books, On the NASA Advisory Board, Executive Vice President of the National Space Society, “NSS Roadmap: Technological Barriers to Space Settlement”, http://www.nss.org/settlement/roadmap/technological.html, 4/24/2011)

No Closed-Loop Life Support System The third issue facing development of a spacefaring civilization is life support. Permanent outposts or settlements can't afford to import life support supplies or equipment over the long term. The current technology is adequate for the space station. It provides partial recycling of water and oxygen, using "physico-chemical" technology. It uses chemical absorbers and reactors, and physical processes such as distillation and reverse osmosis, to recycle water and scrub CO2 from air. Oxygen is reclaimed by water electrolysis and CO2 reduction. Hydrogen and carbon from these processes are waste products, not recycled. There is no food production, and no recycling of wastes or garbage; these are returned to Earth. For the International Space Station, the crew and operations resupply requirement is about 10 kg per person per day. The ISS will typically have a crew of four; in 90 days it needs 900 kg per person; 3600 kg for the crew. This is easily within shuttle capabilities, even the capabilities of a crew and cargo vehicle flying on an ELV. There is little motivation to do better. A Mars proto-settlement of 1,000 people is a lot different. Such a settlement is not feasible with this state of technology. Consider 1000 people, 365 days, at about 10 kg/day. This figures to 3.65 million kg (about 8 million lb) per year. Even at reduced launch cost of $1,000/lb, the delivery cost to Mars is at least $5,000/lb. The annual cost therefore is $40 billion just for life support. No government or consortium of governments will put up with such high cost, and it is out of the question for the private sector. Bioregenerative technology is needed. This technology is also highly applicable to cleaning up our environment here on Earth. A permanent outpost needs a closed micro-ecology or something close to it. This means full recycling of all life support supplies, including waste and garbage. Periods of "no opportunity" for Mars resupply last almost two years; transit times are six months or more. Not only is the cost infeasible for ISS-level technology, the masses to be transported are outrageous. In a bioregenerative system, water and oxygen are recycled by semi-natural means, such as composting or oxidation of organic wastes, and condensation of water. CO2 is taken up by plants, and oxygen generated by photosynthesis. Plants produce food, and some may be ornamental or needed to make the micro-ecology stable. Food production is by "farming" — hydroponics. Animal protein production is feasible in larger outposts. Wastes are completely recycled. Nothing is thrown away. The life support and food production system must have long-term ecological stability. Such a closed-cycle technology is very poorly understood; Biosphere II showed how little we really know. Unfortunately, NASA is investing almost zero in this. A few years ago, NASA invested modestly. However, in today's political climate, these investments are seen as applicable only to non-approved programs and are strongly discouraged. It is likely that developing bioregenerative life support technology to a point of confident use, i.e., where space settlers could depend on it, will take longer to solve than the high cost of space transportation, perhaps much longer.

Colonization Not Possible---Economic Barriers

Note: In order to access this No Solvency Argument you have to win that the Plan uses status quo funding mechanisms

No Colonization-Economy

A. No Long Term Government Funding Mechanism

**Hopkins 11** (Mark Hopkins, Chairman of the Executive Committee for the National Space Society, “NSS Roadmap: Economic Barriers to Space Settlement”, http://www.nss.org/settlement/roadmap/economic.html, 4/24/2011)

No Long-term Government Funding Mechanism: Under current law Congress is not allowed to make financial commitments for more than one year. This is a major economic barrier. It forces the management of space projects to worry about next year's funding in every year of a project. This is true even if the project is on schedule and under budget. Companies can sign contracts that commit them to purchase a large number of items over a long period of time. This approach is frequently used when airlines purchase aircraft or communications satellite companies purchase launch vehicles. Block buying, as it is called, is a win-win way of doing business. It creates economies of scale and reduces the risk for both the supplier of the items (i.e., airplanes or launch vehicles) and for the company that purchases these items. It is also something the U.S. government is currently not allowed to do. Much worse than the inability of the government to do block buys are the implications for the design stability of major space projects. The early history of the International Space Station is a classic example of this problem. When the level of funding from year to year for a project becomes unstable and unpredictable, project plans must be frequently changed. The cost of redesign becomes a large fraction of the project expenses. Morale of employees can also become a problem. Who wants to spend a year of his or her life helping to design something, only to have most of his or her work thrown away? The program also becomes politicized. A savvy prime contractor needs to spend significant resources keeping the program sold in Congress. Decisions need to be made not only for technical, cost and efficiency reasons, but for political reasons as well. Selecting subcontractors so that they are located in the politically optimal congressional districts can become more important then selecting them on the basis of who can do the best job.

B. Lack of incentives for Capital Investment

**Hopkins 11** (Mark Hopkins, Chairman of the Executive Committee for the National Space Society, “NSS Roadmap: Economic Barriers to Space Settlement”, http://www.nss.org/settlement/roadmap/economic.html, 4/24/2011)

Lack of Incentives for Capital Investment: There are clear and widely accepted advantages to having the private sector run the parts of the space program where economic efficiency is important. Where markets exist, such as in communication satellites, private enterprise can do this without help from the government. In others, there may be insufficient incentive for capital investment without special help from the government. **Unless a reasonable profit can be made, commercialization will not occur**. High risk levels and unproven market size are factors that frequently pose problems to making profits and thus to attracting capital investment contributing to commercialization. A traditional approach is for the government to fund research and development that can be transferred to the private sector. This can greatly reduce risk. If the government also funds early operations, then risk can be reduced even further. In recent years there has been discussion of stronger government-sponsored incentives for capital investment. This has been particularly true in the context of how to commercialize potential reusable launch vehicles (RLVs).

C. Insurance Costs & Conditions

**Hopkins 11** (Mark Hopkins, Chairman of the Executive Committee for the National Space Society, “NSS Roadmap: Economic Barriers to Space Settlement”, http://www.nss.org/settlement/roadmap/economic.html, 4/24/2011)

Liability Insurance Costs and Conditions: By international agreement, there is an upper bound on the amount of liability that airlines have when one of their planes crashes. This reduces the possibility that a single crash will bankrupt an airline. Less risk for the airlines results in lower ticket prices. As the number of launch vehicle firms increases and failure rates approach those of commercial airlines, we can expect that RLVs will be treated similarly. Today, however, launch vehicles are known to have a much higher probability of failing. Moreover, there are virtually no players in the game and until there are more, insurance costs will remain a barrier. Current law makes the government liable for damages caused by launch vehicles being developed by the government. A private firm is liable for vehicles being developed with its own funds. In the case of a joint program, such as the X-33 project, where both government and private funds are being used to pay for development, the liability situation is unclear. This uncertainty adds needlessly to costs. We need clarifying legislation.

Colonization Not Possible---Economic Feasibility

Space colonization isn’t realistic- technologically or financially.

Bell 2005 (Jeffrey F., former space scientist and Adjunct Professor for Planetary Science at the Hawai'i Institute of Geophysics & Planetology at the University of Hawaii, “The Dream Palace of the Space Cadets,” Nov.25, http://www.spacedaily.com/news/oped-05zzb.html) OP

Actually, I wasn't laughing then. I never laugh while reading foolish online discussions about space. My reaction is intense frustration. It is frustrating to find that many Space Cadets are shockingly ignorant about space technology - and even more frustrating that the average level of ignorance seems to get worse with every passing year. On the face of it this makes no sense. The first thing you do when you become obsessed with something is study it obsessively, right? And 21st century Space Cadets don't have to plow through yellowing books in college engineering libraries like I did in the 1970s - today the basic facts are there at web sites run by people like Mark Wade and Marcus Lindroos who make extraordinary efforts to dig out obscure information. But for years now, I have been meeting people who are both wildly enthusiastic about space travel as a broad intellectual concept and completely ignorant of the practical details. They don't know how rocket engines work. They don't know the basics of orbital mechanics. They don't know the facts (or the uncertainties) about the dangers of radiation and microgravity. Even worse, they have no idea how much space travel costs, or how these costs compare to other areas of human activity like war or mountain-climbing. They think that Will is all you need to colonize the solar system- they have no concept of the political, financial, and technological investment that it would take. But the small fraction of the pro-space community I meet in person seems tame compared to the internet space chat community. One regularly finds long discussion threads on politically impossible ideas like a one-way Mars suicide mission, financially impossible ideas like building spaceships on the Moon, and technically impossible ideas like ion-powered space blimps. In all these discussions, the few informed people who try to point out the massive problems with these ideas are swamped by a much larger number of enthusiasts who clearly don't know enough basic science or engineering to even understand the issues. I get even more frustrated when I visit the web sites of the various space advocacy groups. They are a pale shadow of the L-5 Society and the Space Studies Institute (both of which I joined in the 1970s). Many of these organizations seem to live in a dream palace of their own creation that has no relationship to the real world at all.

Space transportation is not economically feasible.

Mankins 07 (John C., former manager of NASA’s Advanced Concepts Studies Office of Space Flight,, “Leading Scientists and Thinkers on Energy,” from an interview with Mankins conducted by David Houle, an analyst who advises companies on new developing technology, http://www.evolutionshift.com/blog/2007/10/12/leading-scientists-and-thinkers-on-energy-–-john-c-mankins/) hss

All of the basic science seems to be in hand. Unlike fusion energy R&D, not fundamental problems of science remain to be solved for space solar power to become feasible. However, there are definitely significant technical challenges remaining before economic feasibility can be established. Solving these challenges is more than just engineering—it requires real invention—but not basic research. A number of areas remain to be developed, including wireless power transmission, robotics, materials and structures, thermal management—and, of course, very low cost Earth to orbit transportation is critical.

**Space transportation is too expensive.**

Nansen, 2000 (Ralph H, President, Solar Space Industries, Inc. “The Technical Feasibility of Space Solar Power” Before the Subcommittee on Space and Aeronautics, United States House of Representatives Committee on Science. http://www.seattlewebcrafters.com/chadlupkes/

projects/ralphnansen.php) OP

The existing space transportation market has not been large enough to justify the huge development cost of a reusable heavy lift launch vehicle system. However, solar power satellites would create a large enough market if the perceived risk of their commercial viability is reduced to an acceptable level for the commercial investment community. The commercial investment community has been unwilling to invest in a long term, high cost project of this magnitude. The recent failure of the Iridium global satellite communication system has underscored the potential risks with space based commercial systems.

Space colonization is extraordinarily expensive.

Globus 11 (Al, former NASA administrator, “Space Settlement Basics”, **http://settlement.arc.nasa.gov/Basics/wwwwh.html**) OP

Space colonization is extraordinarily expensive because launch vehicles are difficult to manufacture and operate. For example, the current (2004) cost to put an individual into orbit for a short time is about $20 million. To enable large scale space tourism by the middle class, this cost must be reduced to about $1,000-$10,000, a factor of 3 to 4 orders of magnitude. Space tourism has launch requirements similar to space settlement suggesting that a radical improvement in manufacturing technology may be necessary to enable space colonization. Note that current launch costs vary from $2,000-$14,000 per pound for operational vehicles.

Colonization Not Possible---Travel Times

Travel distances and Establishment of colony takes too long-No viable Tech

**Stross 7** (Charles Stross, Freelance Journalist and Writer, “The High Frontier-Redux”, http://www.antipope.org/charlie/blog-static/2007/06/the-high-frontier-redux.html)

Historically, crossing oceans and setting up farmsteads on new lands conveniently stripped of indigenous inhabitants by disease has been a cost-effective proposition. But the scale factor involved in space travel is strongly counter-intuitive. Here's a handy metaphor: let's approximate one astronomical unit — the distance between the Earth and the sun, roughly 150 million kilometres, or 600 times the distance from the Earth to the Moon — to one centimetre. Got that? 1AU = 1cm. (You may want to get hold of a ruler to follow through with this one.) The solar system is conveniently small. Neptune, the outermost planet in our solar system, orbits the sun at a distance of almost exactly 30AU, or 30 centimetres — one foot (in imperial units). Giant Jupiter is 5.46 AU out from the sun, almost exactly two inches (in old money). We've sent space probes to Jupiter; they take two and a half years to get there if we send them on a straight Hohmann transfer orbit, but we can get there a bit faster using some fancy orbital mechanics. Neptune is still a stretch — only one spacecraft, Voyager 2, has made it out there so far. Its journey time was 12 years, and it wasn't stopping. (It's now on its way out into interstellar space, having passed the heliopause some years ago.) The Kuiper belt, domain of icy wandering dwarf planets like Pluto and Eris, extends perhaps another 30AU, before merging into the much more tenuous Hills cloud andOort cloud, domain of loosely coupled long-period comets. Now for the first scale shock: using our handy metaphor the Kuiper belt is perhaps a metre in diameter. The Oort cloud, in contrast, is as much as 50,000 AU in radius — its outer edge lies half a kilometre away. Got that? Our planetary solar system is 30 centimetres, roughly a foot, in radius. But to get to the edge of the Oort cloud, you have to go half a kilometre, roughly a third of a mile. Next on our tour is Proxima Centauri, our nearest star. (There might be a brown dwarf or two lurking unseen in the icy depths beyond the Oort cloud, but if we've spotted one, I'm unaware of it.) Proxima Centauri is 4.22 light years away.A light year is 63.2 x 103 AU, or 9.46 x 1012 Km. So Proxima Centauri, at 267,000 AU, is just under two and a third kilometres, or two miles (in old money) away from us. But Proxima Centauri is a poor choice, if we're looking for habitable real estate. While exoplanets are apparently common as muck, terrestrial planets are harder to find; Gliese 581c, the first such to be detected (and it looks like a pretty weird one, at that), is roughly 20.4 light years away, or using our metaphor, about ten miles. Try to get a handle on this: it takes us 2-5 years to travel two inches. But the proponents of interstellar travel are talking about journeys of ten miles. That's the first point I want to get across: that if the distances involved in interplanetary travel are enormous, and the travel times fit to rival the first Australian settlers, then the distances and times involved in interstellar travel are mind-numbing. This is not to say that interstellar travel is impossible; quite the contrary. But to do so effectively you need either (a) outrageous amounts of cheap energy, or (b) highly efficient robot probes, or (c) a magic wand. And in the absence of (c) you're not going to get any news back from the other end in less than decades. Even if (a) is achievable, or by means of (b) we can send self-replicating factories and have them turn distant solar systems into hives of industry, and more speculatively find some way to transmit human beings there, they are going to have zero net economic impact on our circumstances (except insofar as sending them out costs us money). What do I mean by outrageous amounts of cheap energy? Let's postulate that in the future, it will be possible to wave a magic wand and construct a camping kit that encapsulates all the necessary technologies and information to rebuild a human civilization capable of eventually sending out interstellar colonization missions — a bunch of self-replicating, self-repairing robotic hardware, and a downloadable copy of the sum total of human knowledge to date. Let's also be generous and throw in a closed-circuit life support system capable of keeping a human occupant alive indefinitely, for many years at a stretch, with zero failures and losses, and capable where necessary of providing medical intervention. Let's throw in a willing astronaut (the fool!) and stick them inside this assembly. It's going to be pretty boring in there, but I think we can conceive of our minimal manned interstellar mission as being about the size and mass of a Mercury capsule. And I'm going to nail a target to the barn door and call it 2000kg in total. (Of course we can cut corners, but I've already invoked self-replicating robotic factories and closed-cycle life support systems, and those are close enough to magic wands as it is. I'm going to deliberately ignore more speculative technologies such as starwisps, mind transfer, or AIs sufficiently powerful to operate autonomously — although I used them shamelessly in my novel Accelerando. What I'm trying to do here is come up with a useful metaphor for the energy budget realistically required for interstellar flight.) Incidentally, a probe massing 1-2 tons with an astronaut on top is a bit implausible, but a 1-2 ton probe could conceivably carry enough robotic instrumentation to do useful research, plus a laser powerful enough to punch a signal home, and maybe even that shrink-wrapped military/industrial complex in a tin can that would allow it to build something useful at the other end. Anything much smaller, though, isn't going to be able to transmit its findings to us — at least, not without some breakthroughs in communication technology that haven't shown up so far.

Colonization Not Possible---Health Hazards

Radiation, Travel times, Medical technicalities, no technology, No habitable environment

**Stross 7** (Charles Stross, Freelance Journalist and Writer, “The High Frontier-Redux”, http://www.antipope.org/charlie/blog-static/2007/06/the-high-frontier-redux.html)

Again, as with interstellar colonization, there are other options. Space elevators, if we build them, will invalidate a lot of what I just said. Some analyses of the energy costs of space elevators suggest that a marginal cost of $350/kilogram to geosynchronous orbit should be achievable without waving any magic wands (other than the enormous practical materials and structural engineering problems of building the thing in the first place). So we probably can look forward to zero-gee vacations in orbit, at a price. And space elevators are attractive because they're a scalable technology; you can use one to haul into space the material to build more. So, long term, space elevators may give us not-unreasonably priced access to space, including jaunts to the lunar surface for a price equivalent to less than $100,000 in today's money. At which point, settlement would begin to look economically feasible, except ... We're human beings. We evolved to flourish in a very specific environment that covers perhaps 10% of our home planet's surface area. (Earth is 70% ocean, and while we can survive, with assistance, in extremely inhospitable terrain, be it arctic or desert or mountain, we aren't well-adapted to thriving there.) Space itself is a very poor environment for humans to live in. A simple pressure failure can kill a spaceship crew in minutes. And that's not the only threat. Cosmic radiation poses a serious risk to long duration interplanetary missions, and unlike solar radiation and radiation from coronal mass ejections the energies of the particles responsible make shielding astronauts extremely difficult. And finally, there's the travel time. Two and a half years to Jupiter system; six months to Mars. Now, these problems are subject to a variety of approaches — including medical ones: does it matter if cosmic radiation causes long-term cumulative radiation exposure leading to cancers if we have advanced side-effect-free cancer treatments? Better still, if hydrogen sulphide-induced hibernation turns out to be a practical technique in human beings, we may be able to sleep through the trip. But even so, when you get down to it, there's not really any economically viable activity on the horizon for people to engage in that would require them to settle on a planet or asteroid and live there for the rest of their lives. In general, when we need to extract resources from a hostile environment we tend to build infrastructure to exploit them (such as oil platforms) but we don't exactly scurry to move our families there. Rather, crews go out to work a long shift, then return home to take their leave. After all, there's no there there — just a howling wilderness of north Atlantic gales and frigid water that will kill you within five minutes of exposure. And that, I submit, is the closest metaphor we'll find for interplanetary colonization. Most of the heavy lifting more than a million kilometres from Earth will be done by robots, overseen by human supervisors who will be itching to get home and spend their hardship pay. And closer to home, the commercialization of space will be incremental and slow, driven by our increasing dependence on near-earth space for communications, positioning, weather forecasting, and (still in its embryonic stages) tourism. But the domed city on Mars is going to have to wait for a magic wand or two to do something about the climate, or reinvent a kind of human being who can thrive in an airless, inhospitable environment.

Microgravity exposure causes bone, muscle, and cardiovascular deterioration.

CNN 2000 (“The Science of the International Space Station,” December 26, http://archives.cnn.com/2000/TECH/space/12/26/part.two/index.html) OP

One of the priorities for NASA is to use the ISS to study what microgravity does to people. Four decades of human space travel show that it weakens the bones, the muscles and even the cardiovascular system. Some astronauts experience nausea or have trouble sleeping. Uri says the goal of this new research is to find ways to make space a friendlier place to live. "Some of the earlier things we're going to be studying is understanding the mechanisms of how those changes actually occur," he says. "So far we've observed what the changes are and now we need to know what the mechanisms are so we can develop counter measures to prevent those changes."

Microgravity exposure causes muscle atrophy and bone deterioration- must develop artificial gravity.

Potember, Bryden, and Shapiro 2001 (Dr. Richard S., Dr. Wayne A., and Dr. Jay R., Researchers for the Applied Physics Laboratory at Johns Hopkins University, “Analysis of bone metabolism biomarkers and countermeasures using time of flight mass spectrometry,”) hss

Exposure to reduced gravity during space travel profoundly alters the loads placed on bone and muscle. Astronauts lose muscle mass and strength while in space. Exercise countermeasures are so important that other activities may not be given enough time. The data from humans in space indicates a very rapid atrophy of skeletal muscle. After 5- day flights, mean cross-sectional areas of muscle fibers were 11 and 24% smaller in type I and II fibers. These changes occurred even though countermeasures were undertaken by astronauts. There is a need to measure pharmacological, hormonal and growth factor biomarkers and to develop in-depth knowledge of molecular mechanisms for complex interplay between muscle atrophy and bone demineralization. We are evaluating the technical feasibility for evaluating the following biomarkers by TOF-MS: growth hormone, insulin-like growth factors (IGF-I), glucocorticoids: cortisol (which may play a central role in the early stages of muscle atrophy), and 3-methylhistidine (breakdown product of muscle proteins). Exposure to microgravity rapidly leads to osteopenia due to increased bone resorption and decreased bone formation. Studies with Skylab and Russian crews demonstrated 1.0-1.6%/month mean losses of bone mass from the spine, femur, neck, and pelvis, increasing the risk of fracture. Also of concern is the lack of evidence that bone loss is fully reversible on return to earth. Progress in developing effective countermeasures to demineralization depends on increased understanding of how the complex biochemical systems that modulate bone turnover response to pharmacological and stress-induced interventions.

Humans can’t survive in space.

Economist’s View 07 (Charlie Stross, “The High Frontier, Redux,” published writer, http://www.antipope.org/charlie/blog-static/2007/06/the\_high\_frontier\_redux.html) OP

We're human beings. We evolved to flourish in a very specific environment that covers perhaps 10% of our home planet's surface area. (Earth is 70% ocean, and while we can survive, with assistance, in extremely inhospitable terrain, be it arctic or desert or mountain, we aren't well-adapted to thriving there.) Space itself is a very poor environment for humans to live in. A simple pressure failure can kill a spaceship crew in minutes. And that's not the only threat. Cosmic radiation poses a serious risk to long duration interplanetary missions, and unlike solar radiation and radiation from [coronal mass ejections](http://en.wikipedia.org/wiki/Coronal_mass_ejection) the energies of the particles responsible make shielding astronauts extremely difficult. And finally, there's the travel time. Two and a half years to Jupiter system; six months to Mars. Now, these problems are subject to a variety of approaches — including medical ones: does it matter if cosmic radiation causes long-term cumulative radiation exposure leading to cancers if we have advanced side-effect-free cancer treatments? Better still, if [hydrogen sulphide-induced hibernation](http://en.wikipedia.org/wiki/Hydrogen_sulfide) turns out to be a practical technique in human beings, we may be able to sleep through the trip. But even so, when you get down to it, there's not really any economically viable activity on the horizon for people to engage in that would require them to settle on a planet or asteroid and live there for the rest of their lives. In general, when we need to extract resources from a hostile environment we tend to build infrastructure to exploit them (such as [oil platforms](http://en.wikipedia.org/wiki/Oil_platform)) but we don't exactly scurry to move our families there. Rather, crews go out to work a long shift, then return home to take their leave. After all, there's no there there — just a howling wilderness of north Atlantic gales and frigid water that will kill you within five minutes of exposure. And that, I submit, is the closest metaphor we'll find for interplanetary colonization. Most of the heavy lifting more than a million kilometres from Earth will be done by robots, overseen by human supervisors who will be itching to get home and spend their hardship pay. And closer to home, the commercialization of space will be incremental and slow, driven by our increasing dependence on near-earth space for communications, positioning, weather forecasting, and (still in its embryonic stages) tourism. But the domed city on Mars is going to have to wait for a magic wand or two to do something about the climate, or reinvent a kind of human being who can thrive in an airless, inhospitable environment.

Colonization Not Possible---Disease

Space diseases have 300% higher mortality rate and are resistant to antibiotics.

Karin 10 (Janice, Senior Managing Editor of Science & Technology at Suite101, “Disease May Derail Space Travel”, 6-23-10, http://thefutureofthings.com/news/9563/disease-may-derail-space-travel.html) OP

The scientists used existing studies concerning astronaut immune systems and the results of two experiments (one in 2006 and one in 2008) where cultures of salmonella were grown simultaneously on Earth and on the space shuttle to allow direct comparisons. The cultures on the space shuttle grew faster and resulted in a 300% increase in mortality rate when injected into mice. Furthermore, the bacteria in space tended to grow a biofilm coating which has proven particularly resistant to antibiotics in the past. This accelerated rate of growth may be caused by fluid shear that creates an environment similar to that found in human intestines. Basically, the salmonella detects the force of surrounding fluids. The salmonella typically slips into the spaces between the villi in the intestines which protect it from the significant churn found in the center of the pathway. Researchers believe the low fluid shear of space is similar to the shear found within these pockets, a condition that sends the bacteria into overdrive as it prepares to enter the blood stream and cause infections. When combined with an observed decrease in the effectiveness of the human immune system in space, the virulence of bacteria growth could cause significant health issues for astronauts on long-term flights. Researchers are exploring the use of different growth medium to control the rate of bacteria virulence. In addition to information about disease in space, these experiments are providing additional information on how salmonella and similar bacteria work more generally which may improve treatment and prevention on Earth and well as in space.

Space travel decreases immunity because of stresses from spaceflight.

NASA 2004 (Dolores Beasley and William Jeffs, Release 04-320, “Study Suggests Spaceflight May Decrease Human Immunity,” September 29, http://www.nasa.gov/home/hqnews/2004/sep/HQ\_04320\_immunity.html) OP

A NASA-funded study has found the human body's ability to fight off disease may be decreased by spaceflight. The effect may even linger after an astronaut's return to Earth following long flights. In addition to the conditions experienced by astronauts in flight, the stresses experienced before launch and after landing also may contribute to a decrease in immunity. Results of the study were recently published in "Brain, Behavior, and Immunity." The results may help researchers better understand the affects of spaceflight on the human immune response. They may also provide new insights to ensure the health, safety and performance of International Space Station crewmembers and future spacefarers on extended missions. "Astronauts live and work in a relatively crowded and stressful environment," said Duane Pierson, the study's principal investigator and NASA Senior Microbiologist at Johnson Space Center, Houston. "Stresses integral to spaceflight can adversely affect astronaut health by impairing the human immune response. Our study suggests these effects may increase as mission duration and mission activity demands increase," he added. The white blood cell count provides a clue to the presence of illness. The five main types of white cells work together to protect the body by fighting infection and attacking foreign material. The most prevalent white blood cells are called neutrophils. From 1999 to 2002, scientists from NASA, Enterprise Advisory Services, Inc., of Houston, and the Boston University School of Medicine compared neutrophil functions in 25 astronauts. They made comparisons after five-day Space Shuttle missions and after nine to 11 day missions. Researchers found the number of neutrophils increased by 85 percent at landing compared to preflight levels. Healthy ground control subjects, who did not fly, exhibited no more than a two percent increase. Researchers also discovered functions performed by these cells, specifically ingestion and destruction of microorganisms, are affected by factors associated with spaceflight. The effect becomes more pronounced during longer missions. The increase in astronaut neutrophil numbers resulted in a corresponding increase (more than 50 percent) in total white blood cell counts at landing. The increase is a consistent consequence of stress. Pierson emphasized that "no astronauts in the study became ill; however, longer exploration missions may result in clinical manifestations of decreased immune response." Researchers concluded the general effect of spaceflight, pre- and post flight-related stress decreases the ability of crewmembers' neutrophils to destroy microbial invaders. This finding suggests crewmembers returning from longer missions may be briefly more susceptible to infections than before launch, because these cells are not as efficient in ingesting and destroying infectious agents.

Space travel increases risk of contracting AIDS and cancer.

Sastry 2001 (Dr. Jaqannadha K., assistant professor of experimental veterinary pathology, Texas Medical Center News (Ronda Wendler), "Studies on Cell-Mediated Immunity Against Immune Disorders,” http://www.tmc.edu/tmcnews/10\_15\_01/page\_02.html) OP

Space travel can cause reduced immunity which leads to increased risk for infections. Immunodeficiency is also the basis for several cancers and AIDS. This project applied the ground-based microgravity technology developed by NASA to help understand immune disorders such as cancer and AIDS. This line of study may eventually help in the design of treatments and vaccines for these conditions.

Colonization Not Possible---Terraforming Fails

Can’t colonize the Moon or Mars – no technology

Williams 2010. (Lynda Williams is a professor at Santa Rosa Junior College. “Irrational Dreams of Space Colonization” Peace Review, a Journal of Social Justice The New Arms Race in Outer Space (22.1, Spring 2010) http://www.scientainment.com/lwilliams\_peacereview.pdf) hss

What do the prospects of colonies or bases on the Moon and Mars offer? Both the Moon and Mars host extreme environments that are uninhabitable to humans without very sophisticated technological life supporting systems beyond any that are feasible now or will be available in the near future. Both bodies are subjected to deadly levels of solar radiation and are void of atmospheres that could sustain oxygen-based life forms such as humans. Terra- forming either body is not feasible with current technologies or within any reasonable time frames so any colony or base would be restricted to living in space capsules or trailer park like structures which could not support a sufficient number of humans to perpetuate and sustain the species in any long term manner.

Colonization Not Possible---No International Laws

Space colonization will fail – no international laws

Williams 2010. (Lynda Williams is a professor at Santa Rosa Junior College. “Irrational Dreams of Space Colonization” Peace Review, a Journal of Social Justice The New Arms Race in Outer Space (22.1, Spring 2010) http://www.scientainment.com/lwilliams\_peacereview.pdf) hss

Since the space race began 50 years ago with the launch of Sputnik, the space environment around Earth has become overcrowded with satellites and space debris, so much so, that circumterrestrial space has become a dangerous place with an increasing risk of collision and destruction. Thousands of pieces of space junk created from launches orbit the Earth in the same orbit as satellites, putting them at risk of collision. Every time a rocket is launched, debris from the rocket stages are put into orbital space. In 2009 there was a disastrous collision between an Iridium satellite and a piece of space junk that destroyed the satellite. In 2007 China blew up one of its defunct satellites to demonstrate its antiballistic missile capabilities, increasing the debris field by 15%. There are no international laws prohibiting anti-satellite actions. Every year, since the mid 1980s, a treaty has been introduced into the UN for a Prevention of an Arms Race in Outer Space (PAROS), with all parties including Russia and China voting for it except for the US. How can we hope to pursue a peaceful and environmentally sound route of space exploration without international laws in place that protect space and Earth environments and guarantee that the space race to the moon and beyond does not foster a war over space resources? Indeed, if the space debris problem continues to grow unfettered or if there is war in space, space will become too trashed for launches to take place without risk of destruction.

And, lack of international law allows for militarization of colonized bodies.

Williams 2010. (Lynda Williams is a professor at Santa Rosa Junior College. “Irrational Dreams of Space Colonization” Peace Review, a Journal of Social Justice The New Arms Race in Outer Space (22.1, Spring 2010) http://www.scientainment.com/lwilliams\_peacereview.pdf) hss

The technological hurdles prohibiting practical space colonization of the Moon and Mars in the near future are stratospherically high. The environmental and political consequences of pursuing these lofty dreams are even higher. There are no international laws governing the Moon or the protection of the space environment. The Moon Treaty, created in 1979 by the United Nations, declares that the Moon shall be developed to benefit all nations and that no military bases could be placed on the moon or on any celestial body, and bans altering the environment of celestial bodies. To date, no space faring nation has ratified this treaty, meaning, the moon, and all celestial bodies, including Mars and asteroids are up for the taking. If a nation did place a military base on the moon, they could potentially control all launches from Earth. The Moon is the ultimate military high ground. How should we, as a species, control the exploration, exploitation and control of the Moon and other celestial bodies if we can not even agree on a legal regime to protect and share its resources?

Colonization Not Possible---Mars

Mars colonization costs a ton and takes forever

Dinkin 4 – Sam Dinkin, columnist for the Space Review, September 7, 2004, “Colonize the Moon before Mars,” online: http://www.thespacereview.com/article/221/1

It will probably take decades of subsidy before a Mars colony could sustain itself. A twenty-year program of $50-billion-a-year subsidies would hit a trillion dollars. This is an affordable sum for a rich planet. It would be an excellent idea to get started if this were the only space colonization option. There is a much better option, however, teasing us as it hangs in the sky.

Colonization of Mars impossible – no one could survive making it to Mars

Williams 2010. (Lynda Williams is a professor at Santa Rosa Junior College. “Irrational Dreams of Space Colonization” Peace Review, a Journal of Social Justice The New Arms Race in Outer Space (22.1, Spring 2010) http://www.scientainment.com/lwilliams\_peacereview.pdf) hss

A Moon base is envisioned as serving as a launch pad for Martian expeditions, so the infeasibility of a lunar base may prohibit trips to Mars, unless they are launched directly from Earth. Mars is, in its closest approach, 36 million miles from Earth and would require a nine-month journey with astronauts exposed to deadly solar cosmic rays. Providing sufficient shielding would require a spacecraft that weighs so much it becomes prohibitive to carry enough fuel for a roundtrip. Either the astronauts get exposed to lethal doses on a roundtrip, or they make a safe one-way journey and never return. Either way, no one can survive a trip to Mars and whether or not people are willing to make that sacrifice for the sake of scientific exploration, human missions to Mars do not guarantee the survival of the species, but rather, only the death of any member who attempts the journey.

AT: Artificial Gravity---Status Quo Solves

New plans in place for developing artificial gravity.

Hsu 10 (Jeremy, Senior writer at Space.com, http://www.msnbc.msn.com/id/37120546/ns/technology\_and\_science-space/t/artificial-gravity-could-solve-space-problems/) OP

New plans for artificial gravity tests in space using centrifuges may hold the key to helping future astronauts ward off the debilitating loss of muscle and bone due to weightlessness on long missions to asteroids or the moon under NASA's revised space exploration plan. The new NASA budget proposed by President Barack Obama not only sets sights on long-duration missions, but also extends the lifetime of the International Space Station. Upgrades for the space station "could include a centrifuge to support research into human physiology," according to a summary by the Office of Management and Budget. Space station residents currently rely upon different exercises to keep themselves fit for the eventual return to Earth. But a spinning centrifuge device could create artificial gravity, which simulates the gravitational tug that a planet such as Earth has. The giant spinning device will give astronauts a healthy break from the weightlessness of space.

AT: Econ Adv- Tech spin-off

Government innovation doesn’t boost the economy- tech spin-offs happen to slowly.

Newton 11 (Elizabeth, Director for Space Policy- U Alabama-Huntsville, with Michael D. Griffin, United States space policy and international partnership, Space Policy 27 n 1, 2011)

2.2. Innovation President Obama’s budget request and Congress’ authorization law support new funding for NASA’s development of ‘gamechanging’ technology. One problem created, however, is that, by proposing cancellation of the Constellation program, the policy removed the near-term destination and overarching architecture that provide the defining requirements for technology development. ‘Flexible path’ approaches and one-off destinations such as an asteroid risk disaggregating the agency’s technology work into a set of sand-boxes that cannot be integrated into subsequent systems development down the line. The historical record is rife with publicly funded technology initiatives that failed to deliver value for the investments made, absent well-defined system requirements. Further, spin-out commercialization of technology developed in the public sector occurs at a low, perhaps even inconsequential, rate; the government is not an effective economic engine.

\*\*\* AT: Leadership Adv \*\*\*

Leadership Adv- Alt Cause

Alternative Causality- economy collapse.

Roberts, 9[Paul Craig Roberts, economist, 2009 “The Era of American Leadership Is Over” http://www.creators.com/opinion/paul-craig-roberts/the-era-of-american-leadership-is-over.html]

The discouraging fact is that even when faced with crisis in the economy and in foreign policy, the American political system is incapable of producing any leadership. Here we are in the worst economic crisis in a lifetime, perhaps in our history, and on the brink of war in Pakistan and Iran while escalating the war in Afghanistan, and all we get is a government made up of the very people who have brought us to these crises. Just as the Bushites could not admit the failure of their man, the Obamacons will not be able to admit the failure of their man. The era of American leadership has passed. America's shyster financial system has brought economic crisis to the world. America's wars of aggression are seen as serving no purpose except the enrichment of the military industries associated with Dick Cheney. The world is looking elsewhere for leadership.

International cooperation is a prerequisite for American space leadership.

Freidman, 2/14 [Lou Freidman 2/14/11 “American Leadership” http://www.thespacereview.com/article/1778/1]

“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. Space exploration and development are often overlooked in foreign relations and geopolitical strategies. 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. These are great existing and proposed missions, which engage much of the world and advance the interests of the US and other nations, inspire the public, and promote cooperation among technical and scientific communities worldwide. Yet space exploration and development are often overlooked in foreign relations and geopolitical strategies.

Leadership Adv- AT: Space Race

The space race is over- peaceful uses of outer space are now an international priority.

UN, 4/12 [source: UN 4/12/11 “United Nations: Cold War Space Race Is over; We all Won” http://www.spaceref.com/news/viewsr.html?pid=36696]

Resolution Taken up on Initiative of Russian Federation, 'Cold War Space Race Is Over; We All Won,' Says United States Representative An annual International Day of Human Space Flight was declared by the General Assembly this afternoon, to be celebrated on 12 April, the date of the first manned space flight in 1961. By to a new resolution adopted unanimously by the world body (document A/65/L.67), the first International Day in 2011 would mark the fiftieth anniversary of the flight of Russian cosmonaut Yuri Gagarin and reaffirm "the important contribution of space science and technology in achieving sustainable development goals and increasing the well-being of States and peoples". The International Day would also serve to further the aspiration to maintain outer space for peaceful purposes, according to the Assembly, which noted through the resolution that the fiftieth anniversary of its Committee on the Peaceful Uses of Outer Space would be commemorated this year as well.

The US would win a Space Race vs. the Chinese

Boozer, 5-19 (Rick, Ph D in Astrophysics, Yahoo News, The United states will beat china in the newest space race, <http://news.yahoo.com/s/ac/20110519/sc_ac/8496119_united_states_will_beat_china_in_newest_space_race>, JG)

America is laying the groundwork for its greatest space endeavor since sending astronauts to the Moon. But that's not the story you will hear from a few senators and congressional representatives who are more concerned with bringing home pork than significantly advancing U.S. spaceflight prowess. Exaggerating China's future spaceflight plans is one of their favorite strategies. In fact Chinese space ambitions are modest. Their yet-to-be-started [space station](http://us.rd.yahoo.com/dailynews/ac/sc_ac/storytext/8496119_united_states_will_beat_china_in_newest_space_race/41535210/SIG=1265fvbqf/*http:/www.space.com/11592-china-space-station-tiangong-details.html) won't be complete until 2020 at the earliest. It will weigh only 60 tons compared to the International Space Station's 400 tons and less than half the defunct Russian MIR station's 130 tons. China's state news announced they are tentatively considering a [gigantic super rocket](http://us.rd.yahoo.com/dailynews/ac/sc_ac/storytext/8496119_united_states_will_beat_china_in_newest_space_race/41535210/SIG=12767ijcq/*http:/news.xinhuanet.com/english2010/china/2011-03/03/c_13759948.htm). It prompted [Rep. Frank Wolf of Virginia to say](http://us.rd.yahoo.com/dailynews/ac/sc_ac/storytext/8496119_united_states_will_beat_china_in_newest_space_race/41535210/SIG=12bo2bajo/*http:/wolf.house.gov/index.cfm?sectionid=34&sectiontree=6,34&itemid=1724), "The announcement made clear that if the United States does not get serious about its own Exploration Program, the next flag planted on the moon may be a Chinese flag." Even before the announcement, Rep. Bill Posey of Florida made similar [dire predictions](http://us.rd.yahoo.com/dailynews/ac/sc_ac/storytext/8496119_united_states_will_beat_china_in_newest_space_race/41535210/SIG=123kf1n0t/*http:/posey.house.gov/News/DocumentSingle.aspx?DocumentID=232177) about future Chinese space accomplishments. However, careful reading of the Chinese article reveals it is a preliminary feasibility study, NOT any actual plan to build the rocket. Furthermore, given that the rocket would carry a 130-ton payload, which is *exactly* the same payload weight as the [super rocket demanded by certain U.S. Senators](http://us.rd.yahoo.com/dailynews/ac/sc_ac/storytext/8496119_united_states_will_beat_china_in_newest_space_race/41535210/SIG=12lt8g6sf/*http:/www.associatedcontent.com/article/7858828/senators_crippling_nasa.html?cat=9), the Chinese study is probably just a knee-jerk response to the Senators' efforts. But the Chinese are glimpsing something that disturbs them. They are worried that the American company [SpaceX](http://us.rd.yahoo.com/dailynews/ac/sc_ac/storytext/8496119_united_states_will_beat_china_in_newest_space_race/41535210/SIG=10o4v26cn/*http:/www.spacex.com/) can launch satellites and people into space for [prices so low](http://us.rd.yahoo.com/dailynews/ac/sc_ac/storytext/8496119_united_states_will_beat_china_in_newest_space_race/41535210/SIG=12a3k6en9/*http:/www.innovationnewsdaily.com/elon-musk-private-rocket-prices-1957/) that [the Chinese can't compete with them](http://us.rd.yahoo.com/dailynews/ac/sc_ac/storytext/8496119_united_states_will_beat_china_in_newest_space_race/41535210/SIG=1588ehrqe/*http:/www.aviationweek.com/aw/generic/story_channel.jsp?channel=space&id=news/asd/2011/04/15/11.xml&headline=China%20Great%20Wall%20Confounded%20By%20SpaceX%20Prices) ! SpaceX is one of the companies NASA is hiring to come up with space vehicles for sending astronauts to the ISS under its *Commercial Crew Development* (*CCDev*) program. Other CCDev companies include veteran aerospace giant [Boeing](http://us.rd.yahoo.com/dailynews/ac/sc_ac/storytext/8496119_united_states_will_beat_china_in_newest_space_race/41535210/SIG=1273v221v/*http:/www.boeing.com/Features/2011/04/bds_natl_space_symp_04_11.html) and newcomers [Sierra Nevada Corporation](http://us.rd.yahoo.com/dailynews/ac/sc_ac/storytext/8496119_united_states_will_beat_china_in_newest_space_race/41535210/SIG=1235dicir/*http:/www.nasa.gov/offices/c3po/partners/sierranevada/index.html) and [Blue Origin](http://us.rd.yahoo.com/dailynews/ac/sc_ac/storytext/8496119_united_states_will_beat_china_in_newest_space_race/41535210/SIG=11k7s0lc9/*http:/www.spaceref.com/news/viewsr.html?pid=36766). Competition between these companies would bring down launch prices allowing NASA to have more money for developing technology we will need [to send Americans to the Moon, asteroids, and Mars](http://us.rd.yahoo.com/dailynews/ac/sc_ac/storytext/8496119_united_states_will_beat_china_in_newest_space_race/41535210/SIG=13251f6mb/*http:/abcnews.go.com/Blotter/nasas-charles-bolden-americans-deep-space/story?id=13620479&page=3). However, the [money hungry super rocket](http://us.rd.yahoo.com/dailynews/ac/sc_ac/storytext/8496119_united_states_will_beat_china_in_newest_space_race/41535210/SIG=12lt8g6sf/*http:/www.associatedcontent.com/article/7858828/senators_crippling_nasa.html?cat=9) (that politicians are forcing NASA to build with obsolete and expensive 1980's era shuttle technology) jeopardizes the development of deep space exploration technology by potentially gobbling any money freed up with CCDev. Not relying heavily on subcontractors as its competition does, SpaceX manufactures 80% of its vehicle parts, giving them greater quality control. They use the same rocket engine in all of their launch vehicles. When they want more power, they add more engines to the vehicle, giving them economies of scale. Those are just a couple of the *many* ways they hold prices down while insuring high quality and safety. That affordability is allowing them to develop [the most powerful launcher since the Saturn V moon rocket](http://us.rd.yahoo.com/dailynews/ac/sc_ac/storytext/8496119_united_states_will_beat_china_in_newest_space_race/41535210/SIG=118bp67ja/*http:/www.spacex.com/falcon_heavy.php) *- totally on their own with no government money*! The other companies participating in CCDev also use American ingenuity to bring prices down. In a few years because of their cost savings, *more astronauts will be launched into orbit than have ever been before!* And if politicians can be prevented from squandering the money freed up by CCDev, Americans will lead the way in exploration throughout the inner solar system with such proposed NASA projects as [*Nautilus-X*](http://us.rd.yahoo.com/dailynews/ac/sc_ac/storytext/8496119_united_states_will_beat_china_in_newest_space_race/41535210/SIG=11dl36l6d/*http:/hobbyspace.com/nucleus/?itemid=26786) at much lower cost than the traditional way of doing things. Nautilus would be the first *true* spaceship that would *stay in space and never land*, with astronauts brought to it from Earth by the CCDev vehicles. NASA can accomplish great things without a budget increase. If we have the national will, the U.S. will dominate outer space, not the Chinese!

AT: Aerospace Industry Advantage

ITAR prevents the development of the Aerospace Industry

NASA Academy ’08 (NASA Academy, ROADMAP TO A SPACE FARING CIVILIZATION, http://www.eng.buffalo.edu/~cheetham/index\_files/NA08\_GSFC\_RSFC\_VER\_1.0.pdf) JL

Another area of concern with ITAR is its effect on the United States aerospace industry as a competitor in the global market. Because the process to obtain export licenses can be so costly, foreign customers often choose to deal with ITAR-free or non-U.S. companies. According to research done by the Department of Commerce and the Bureau of Industry and Security, between 2003 and 2006, the US share in the global market has decreased by 20% for all commercial communications satellites and by 10% for geosynchronous satellites. The reported loss of all foreign sales due to ITAR during the four year period was $2.35 billion. Furthermore, the study found that the average yearly cost of compliance industry-wide was $49 million. Many countries who would usually buy from the United States are instead researching the technologies themselves which is essentially proliferating the same technology that ITAR is intended to protect.,

Decline inevitable- workforce retiring- The AE industry will become too inexperienced soon

Anselmo Aviation Week & Space Technology February 5, 2007, Joseph C Anselmo, Baby Boomer retirements could trigger A&D engineering crisis http://integrator.hanscom.af.mil/2007/February/02082007/02082007-17.htm

The alarming truth is that the A&D industry is not attracting nearly enough skilled workers, particularly engineers, to replace those getting ready to retire. The looming shortfall, underscored in two workforce studies undertaken for Aviation Week & Space Technology by Bain & Co. and Deloitte Consulting, threatens to sap the industry's vitality and could make it harder for the U.S. military to maintain its enviable technological edge over the long run.  The long shadow of an aging workforce is cast across the entire industry, from military scientists to commercial pilots to maintenance, repair and overhaul technicians. But the danger is most acute in engineering. "Engineering is the core of what makes companies successful, and it is by far the function that is most constrained by supply," says Michael Goldberg, lead partner in Bain's A&D practice. By next year, an estimated one-in-four U.S. aerospace workers will be eligible to retire; nearly one-in-three civilian scientific and technical workers in the Defense Dept. have already reached that milestone (see p. 48). And the full impact of the graying workforce hasn't hit yet. In 2011, an 18-year-long wave of baby boomers will start collecting Social Security and Medicare benefits. Another problem: massive layoffs during the consolidations of the 1990s that left the defense industry with a shortage of middle-aged talent. This means the tasks of many retirees could fall to younger, less-experienced workers. "We need to go out and basically generate a new workforce of knowledge workers to replace those experienced people who are going out the door," says Clay Jones, president/CEO of Rockwell Collins. Finding those workers will be a daunting challenge. U.S. students show an alarmingly low interest in science and math. And for those that do go into engineering, aerospace doesn't have the cachet it did during the Cold War and Apollo program. Today's engineering graduates rank A&D low--if not dead last--on their list of industries providing desirable employment, far behind high tech and professional services (AW&ST Jan. 15, p. 72). Just 7% of students at 15 top engineering schools interviewed for the Bain study expect to pursue a career in A&D. "It was not even in my consciousness as an engineering graduate in 1968 that I had an opportunity to make a lot of money," says Lester L. Lyles, a retired four-star U.S. Air Force general who is now a technology consultant. "The young people today have so much more available to them and so many other opportunities to make money quickly. Silicon Valley sort of galvanized that. I don't think the interest in coming up to be a pure engineer is there anymore."

We need to focus on Education before Aerospace

Anselmo Aviation Week & Space Technology February 5, 2007, Joseph C Anselmo, Baby Boomer retirements could trigger A&D engineering crisis http://integrator.hanscom.af.mil/2007/February/02082007/02082007-17.htm

If current trends hold, the industry will be able to replace only about half of the 57,000-68,000 military engineers that are expected to retire by 2010. And that doesn't take into account the additional engineers that will be needed to accommodate even modest growth in U.S. military spending. The bottom line: a potential shortfall of 41,000-87,000 defense engineers by 2010. "The concern is there is an imminent talent gap," says Lori Flees, a Bain partner who focuses on human capital issues. "It could hit pretty quickly. It definitely will hit in the next five years." Such a shortfall would intensify competition for engineering talent. "I'm recruiting from Lockheed Martin and Raytheon and General Dynamics and they're recruiting from us, because the source from outside is not that big," says Daniel J. Murphy, chairman/CEO of Alliant Techsystems. Indeed, Bain's interviews with 10 headhunters found A&D to be extremely insular, with very few engineers moving in or out of the industry. To be sure, almost every major aerospace company is taking steps in both recruitment and retention to address the workforce challenge. "It's the Number One focus at Lockheed Martin and in the entire industry," says Lockheed Martin CFO Christopher E. Kubasik. Companies are bolstering recruitment campaigns in colleges. Internally, they're pairing veterans with younger workers to help them learn skills and on-the-job experience more quickly.  Diversity programs help cast a wider net for talent. Raytheon is courting gays and lesbians, a notable move in the conservative defense industry, and became the first aerospace company to win a 100% rating from the Human Rights Campaign, a leading gay rights organization. Such efforts are paying off. In a recent Business Week ranking of best places to work in all industries, Lockheed Martin placed second and Raytheon seventh. On the education front, companies are establishing mentoring and internship programs for college and high school students. The industry is providing financial support for initiatives aimed at getting younger students interested in science and math. Aerospace companies in Tulsa, Okla., recently banded together to help create new pre-engineering courses for teens in public and private schools (see p. 50). "It's not the universities that create the problem, it's K-12," says Jones. "That's the problem we've got to work."

The aerospace industry will not have enough people to work

Anselmo Aviation Week & Space Technology February 5, 2007, Joseph C Anselmo, Baby Boomer retirements could trigger A&D engineering crisis http://integrator.hanscom.af.mil/2007/February/02082007/02082007-17.htm

Bain & Co.'s Goldberg believes that focusing on supply alone won't be enough to bridge the shortfall between retirees and the supply of new engineers. He says companies need to make "strategic portfolio investments" based on engineering being a constrained resource. At the workplace level, A&D contractors should try to reduce demand on engineers by offloading non-critical tasks, giving them new hardware and software tools to increase productivity "Hiring someone in a support function to handle less-technical tasks is much cheaper than hiring another engineer," he says. "It also has the double benefit of making the engineer's job much more appealing, which helps with retention and increases engineering design capacity at the same time." Pratt & Whitney is one of the companies in the forefront of looking for alternative sources of engineering talent. Five years ago, the company began outsourcing basic design work to Infotech, an engineering services company based in India, to free up its U.S. engineers to work on defense projects. Today, Infotech is taking on more complex engineering tasks and serves as a flexible outlet for Pratt's work. Even those who, so far, have been insulated from the problem see challenging times ahead. "We're going to lose a lot of experience," says Lockheed Martin's Lawson. "There may be some fuzz on exactly when it will happen--people may stay longer than we think they will--but the numbers are the numbers." But Lawson also believes the industry is doing a much better job of retaining experienced technical workers. "The dot.com period was really challenging," he recalls. "We were really having a hard time hanging onto our engineers. We don't have that kind of attrition today." Rockwell Collins' Jones also sees a silver lining in the workforce challenge. The company hires about 2,000 people a year, and most of them are recent college graduates or in that age range. He says they tend to be savvy and much more comfortable with software and other new tools than the retirees they replace. "They're very eager to experiment," he says. "So while we're losing experience, we're gaining some innovation and entrepreneurial spirit."

\*\*\* AT: Helium 3 Adv \*\*\*

AT: Helium3 Advantage

Helium 3 mining is unrealistic

Williams 2010. (Lynda Williams is a professor at Santa Rosa Junior College. “Irrational Dreams of Space Colonization” Peace Review, a Journal of Social Justice The New Arms Race in Outer Space (22.1, Spring 2010) http://www.scientainment.com/lwilliams\_peacereview.pdf) hss

Although evidence of water has been discovered on both bodies, it exists in a form that is trapped in minerals, which would require huge amounts of energy to access. Water can be converted into fuel either as hydrogen or oxygen, which would eliminate the need to transport vast amounts of fuel from Earth. However, according to Britain's leading spaceflight expert, Professor Colin Pillinger, "You would need to heat up a lot of lunar soil to 200C to get yourself a glass of water." The promise of helium as an energy source on the moon to is mostly hype. Helium-3 could be used in the production of nuclear fusion energy, a process we have yet to prove viable or efficient on Earth. Mining helium would require digging dozens of meters into the lunar surface and processing hundreds of thousands of tons of soil to produce 1 ton of helium-3. (25 tons of helium-3 is required to power the US for 1 year.) Fusion also requires the very rare element tritium, which does not exist naturally on the Moon, Mars or on Earth in abundances needed to facilitate nuclear fusion energy production. There are no current means for generating the energy on the Moon to extract the helium-3 to produce the promised endless source of energy from helium-3 on the Moon. Similar energy problems exist for using solar power on the Moon, which has the additional problem of being sunlit two weeks a month and dark for the other two weeks.

\*\*\* DA Links \*\*\*

Spending/Politics Link---Colonization

The plan requires continually re-authorizing funding---Congress hates locking in long-term expensive commitments

Correll 5 – Randall R. Correll, national security consultant with Science Applications International Company, and Nicholas Peter, 2005, “Odyssey: Principles for enduring space exploration,” Space Policy, Vol. 21, p. 251-258

With his re-election to a second term, US President Bush secured another four years to get his Vision for Space Exploration off to a solid start. Nonetheless, the multidecadal space exploration strategy laid out in January 2004 still faces considerable challenges. One is convincing the Congress to continually approve the funding that NASA is seeking to complete the effort. Another challenge is to convince various international partners, and especially Europe, to join this Vision for Space Exploration, since a successful agreement on the future direction of the ISS is the prerequisite to any significant European participation in this program. Additionally, the vision will require the support of many newly elected administrations and Congresses in the ensuing years. Structuring a program with enduring support will be a challenge, and many potential pitfalls lie ahead.

Politics Link---Colonization---AT: Link Turns

No turns---zero constituency in Congress that cares about space colonization

Day 9 – Dwayne Day, senior program officer at the National Research Council’s Aeronautics and Space Engineering Board, May 18, 2009, “The God that Failed,” http://www.thespacereview.com/article/1376/1

At its best, the space colonization vision was sophisticated daydreaming, not a future that a large number of Americans wanted to make happen. The vision had its shot and never caught on, despite appearing in the pages of a highly reputable magazine and gaining the attention of political decision makers. Gravity, weightlessness, radiation, and economics may all have ultimately made this vision untenable, but its biggest problem was that people didn’t like it.

We are living in the future that National Geographic’s experts speculated about. The cities are all right. World War III is no longer looming overhead. But grand visions of space colonization no longer appear in popular media. They no longer gain attention on news programs or in the halls of Congress. The Future, it was wonderful, but now it survives largely in the pages of faded magazines.

\*\*\* Disad Impact Helpers\*\*\*

War Turns Space Exploration

War turns space exploration---diverts resources and destroys international coop

Correll 5 – Randall R. Correll, national security consultant with Science Applications International Company, and Nicholas Peter, 2005, “Odyssey: Principles for enduring space exploration,” Space Policy, Vol. 21, p. 251-258

Over the next 15 years before humans return to the Moon, the geopolitical context might be as different as it was 15 years ago.22 This could prove very disruptive for space exploration by diverting resources to more pressing security needs and by unsettling the alliances needed to sustain multidecadal projects. Therefore, to have a sustainable exploration initiative it has to be flexible and open to geopolitical evolution. The emergence of China and India as global powers, as well as other nations as new regional powers, will transform the geopolitical landscape as much as did the ascent of the USA in the 20th century. Notwithstanding the security and economic challenges of the future, the proliferation of space power will help sustain space exploration as long as these new actors can seamlessly connect into the ongoing open architectures. Despite the vicissitudes of national powers waxing and waning, the benefit of exploration to humankind will always be on the ascendant.

Nuke War accesses aff Impact calc

Nuclear war same - as environmental extinction

Marusek ‘03

[James A. Marusek ] 2003 Nuclear Physicist & Engineer. U.S. Department of the Navy,

http://www.breadandbutterscience.com/Permian.pdf

The effects of an asteroid or comet impact have been compared to that of a large nuclear weapon. Although the comparison may be a good approximation, there is one significant difference. In a nuclear weapons blast, the kinetic energy is released spherically in all directions. In an impact, the kinetic energy is focused along the line of the impact vector. This paper makes the hypothesis that a large impactor can tear through the Earth’s crust and release most of its energy deep within the mantle. This is especially true for an impact where the crust is thin, such as an ocean impact. The process is called acoustic fluidization [7]. The impact energy turns the solid crust into liquid. The impactor in a fraction of a second cuts its way through the atmosphere, the ocean and the Earth’s crust in a manner similar to a shaped-charge projectile penetrating tank armor. Unlike a surface impact that leaves behind a large crater and throws up a worldwide debris field, these deep impactors generate large scars or crustal uplifts burying much of the impact debris.

The chance of extinction in nuclear war is high

Marusek ‘03

[James A. Marusek ] 2003 Nuclear Physicist & Engineer. U.S. Department of the Navy,

http://www.breadandbutterscience.com/Permian.pdf

It is possible for humanity (or its descendents) to survive a million years or more, but we could succumb to extinction as soon as this century. During the Cuban Missile Crisis, U.S. President Kennedy estimated the probability of a nuclear holocaust as “somewhere between one out of three and even” (Kennedy, 1969, p. 110). John von Neumann, as Chairman of the U.S. Air Force Strategic Missiles Evaluation Committee, predicted that it was “absolutely certain (1) that there would be a nuclear war; and (2) that everyone would die in it” (Leslie, 1996, p. 26).

More recent predictions of human extinction are little more optimistic. In their catalogs of extinction risks, Britain’s Astronomer Royal, Sir Martin Rees (2003), gives humanity 50-50 odds on surviving the 21st century; philosopher Nick Bostrom argues that it would be “misguided” to assume that the probability of extinction is less than 25%; and philosopher John Leslie (1996) assigns a 30% probability to extinction during the next five centuries. The “Stern Review” for the U.K. Treasury (2006) assumes that the probability of human extinction during the next century is 10%. And some explanations of the “Fermi Paradox” imply a high probability (close to100%) of extinction among technological civilizations (Pisani, 2006).4

Nuclear war has the biggest impact

Marusek ‘03

[James A. Marusek ] 2003 Nuclear Physicist & Engineer. U.S. Department of the Navy,

<http://www.breadandbutterscience.com/Permian.pdf>

Estimating the probabilities of unprecedented events is subjective, so we should treat these numbers skeptically. Still, even if the probability of extinction is several orders lower, because the stakes are high, it could be wise to invest in extinction countermeasures

Globus ‘11

NASA Responsible Official: Dr. Ruth Globus, April 29, 2011

http://settlement.arc.nasa.gov/Basics/wwwwh.html

Space colonization is extraordinarily expensive because launch vehicles are difficult to manufacture and operate. For example, the current (2004) cost to put an individual into orbit for a short time is about $20 million. To enable large scale space tourism by the middle class, this cost must be reduced to about $1,000-$10,000, a factor of 3 to 4 orders of magnitude.

We need to prevent what we have control of

Matheny ’07

Jason G. Matheny, 2007 [emerging disruptive technologies, catastrophic risks, economics, evaluation, ethics, agriculture, biodefense, biosecurity, uncertainty, forecasting, modeling and simulation, risk analysis, epidemiology]

<http://physics.harvard.edu/~wilson/pmpmta/Mahoney_extinction.pdf>

In this article, I discuss a subset of catastrophic events—those that could extinguish humanity.1 It is only in the last century, with the invention of nuclear weapons, that some of these events can be both caused and prevented by human action. While extinction events may be very improbable, their consequences are so grave that it could be cost effective to prevent them.

\*\*\*Prizes CP\*\*\*

Prizes CP---1NC

CP TEXT: The United States Federal Government should create and administer a Prize Competition for (AFF)

Prizes Solve

NASA Academy ’08 (NASA Academy, ROADMAP TO A SPACE FARING CIVILIZATION, http://www.eng.buffalo.edu/~cheetham/index\_files/NA08\_GSFC\_RSFC\_VER\_1.0.pdf) JL

5.4 Prizes 5.4.1 Background A proven way of accelerating an industry is through the use of prizes. Prize competitions are challenges proposed in areas in which increased involvement by private individuals or the commercial sector is sought. Prize competitions attract innovative people who are driven by passion, prestige, and personal achievement. Throughout history, prize competitions have been used to foster crucial development in many areas [Appendix C]. Prizes can create heroes, reflecting the level of visibility of the prize and the level of commitment of the general public. An example of this is Charles Lindbergh. The Ansari X PRIZE initiated the commercial development of sub-orbital space flight. The new Google Lunar X PRIZE has started a new, commercial race to the Moon. In order for man to get back to the Moon, NASA and the private industry will be forced to complete lunar characterization missions to determine th e locations of the best landing sites, habitable regions and available resources.

Prizes CP---Solves the Case---Moon Colonization

Prizes would help NASA return to the moon

NASA Academy ’08 (NASA Academy, ROADMAP TO A SPACE FARING CIVILIZATION, http://www.eng.buffalo.edu/~cheetham/index\_files/NA08\_GSFC\_RSFC\_VER\_1.0.pdf) JL

5.4.2 Lunar Characterization Prize Proposal Currently, little is known about the lunar craters, especially those that lie in permanent shadows at the poles. A good way to gain this information is to create a new prize to complement the current missions planned by various space agencies. The goal will be to provide key measurements and information about the environment in these permanently shadowed craters. Such a competition would involve universities and other research entities, and develop 32 interest among the scientific community all around the world. Moreover, a prize competition can create a global scientific competition centered on lunar issues which will be advantageous for the return to the Moon. The instruments used may be secondary payloads on other robotics/manned lunar missions, and may then provide another source of cash-flow for emerging lunar delivery companies. If successful, not only would this prize provide valuable data on the environment in permanently-shadowed lunar craters, but it would verify a new prize model. This new model would provide smaller purses for data that could be used as a secondary funding source for commercial lunar missions. If this prize were successful, similar scientific prizes could be planned. These prizes would not necessarily be the primary mission of a spacecraft, but instead provide an additional opportunity for private companies to make a return on their investment. In the future, it is hoped that when these companies design a business model around landing a spacecraft on the surface of the Moon, that they can choose a few appropriate prizes and receive compensation for the data they collect. The model proposes that NASA would more or less buy the data that it wants and in the prize format would only pay if the data were collected successfully. This prize is detailed more thoroughly in Appendix C. The appendix also has further information on follow-on prize suggestions listed below.

Prizes CP---Solves the Case---General

Prizes increase Public excitement and Technology

Schroeder ’04 (Alex, analyst for the independence institute, The Application and Administration of Inducement Prizes in Technology, http://www.i2i.org/articles/IP\_11\_2004.pdf) JL

Twenty-five percent of all Americans had personally viewed the Spirit of St. Louis in the year immediately following Charles Lindbergh’s Trans-Atlantic flight. Given the state of personal transportation in 1927 as compared to now, this is a staggering number. Prizes in technology have shown to inspire the public much in the same way the NCAA Tournament does for college basketball. As of July 2004, the X Prize 1 had registered 3 billion print impressions of its name in newspapers, journals, and web sites. 2 This number has undoubtedly increased significantly after Burt Rutan claimed the X Prize in October. Prizes have historically been very effective at drawing public sentiment to a technology. An increase in public sentiment means a sequential increase in technology visibility and proliferation. This is evidenced by the way that the country latched on to information technology in the development of Silicon Valley.

Prize Competitions help solve NASA’s Mission and goals

Davidian ’04 (Ken, Member of DMG Associates, private company under contract to NASA, Prizes, Prize Culture, and NASA’s Centennial Challenges, http://www.ip.nasa.gov/documents/prize\_culture\_report.pdf) JL

Prizes have been used throughout history as a way to stimulate technology development with unexpected positive results for a fraction of what an equivalent contract would cost. Prizes have encouraged individuals, companies, and governments to achieve seemingly impossible goals. The popularity of prizes in the first part of the twentieth century and its resurgence in the present day have increased the membership in a “prize culture” that has led to stereotypical reactions by the traditional science and engineering communities. As is common with any stereotype, these contain some level of “truthiness,” but once examined closely, these stereotypes can be seen to link the traditional R&D and prize communities together. The Centennial Challenges program builds on the positive forces of prize competitions in an attempt to pursue NASA’s mission and goals in an exciting, innovative, and cost-effective way.

Prizes Key to Innovation

NASA Academy ’08 (NASA Academy, ROADMAP TO A SPACE FARING CIVILIZATION, http://www.eng.buffalo.edu/~cheetham/index\_files/NA08\_GSFC\_RSFC\_VER\_1.0.pdf) JL

There are many more hurdles and various other possible business markets and accelerators. Those listed above are merely a start. To truly open up space to commercial development, many more ideas, inventions, and innovations will be required. It is thus very fortunate that free market societies such as ours thrive on such challenges. As markets evolve and demand grows entrepreneurs will be attracted to the limitless potential of space based companies. This can already be seen in the recent explosion in interest for sub-orbital space travel.

Prizes encourage different things than the Private Sector and NASA

Kay ’10 (Luciano, School of public policy @ GT, Technology R&D in the context of innovation inducement prizes Insights from the Google Lunar X Prize, PFD, http://www.spp.gatech.edu/faculty/WOPRpapers/Kay.WOPR10.2.pdf) JL

The prize literature suggests that there are at least two main reasons to think that R&D activities in prizes are different from traditional industry practices. First, the capability of prizes to attract unconventional entrants is cited very often (see for example Byko, 2004; Schroeder, 2004; Kalil, 2006). These unconventional entrants comprise individuals and teams that were not previously involved with the prize technologies and bring different approaches, perceptions, knowledge, and fresh ideas to the competition. Moreover, prizes may encourage unconventional partnerships between those entrants and other entities (Culver et al., 2007) and contribute new ways to organize R&D. Second, prizes create an instance of competition that induce a very focused R&D effort by offering a fixed reward and preestablished deadline and technology specifications (Newell & Wilson, 2005). In other words, in principle, teams have to focus their effort on a single and specific goal instead of having a continuous activity with multiple projects or customers. The difference between industry practices and prize R&D may be even more notable in a sector such as aerospace. In space technology, ―traditional industry‖ typically refers to the government led effort that has driven R&D since the 1950s. That is, the aerospace industry has been traditionally dominated by large government agencies from the U.S. and abroad, such as NASA and the Department of Defense, and large companies, such as Northrop Grumman and McDonnell Douglas Corporation (Bromberg, 2000). Technology development in this sector has been typically funded with procurement contracts and research grants with those large corporations. The performance of new systems for both manned and unmanned space flight and exploration has been increased, yet they have become more expensive and more complicated or ―tightly coupled.‖ Increasingly complex projects and longer space missions have led to more complex organizations to develop those new technologies. NASA and other space agencies have become large, centralized, bureaucratic, and less productive organizations - 5 - (McCurdy, 1994; Cucit et al., 2004; Petroni et al., 2009). In general, all these organizations have years of experience in aerospace technologies, strong internal in-house capabilities, extensive control systems to manage large and multiple projects, and hierarchical structures with division of labor and division of R&D centers. Corporate aerospace activity have concentrated in fewer players as well (Cucit et al., 2004). In particular in the U.S., the activities of large contractors have been influenced to great extent by NASA subcontracting and supervision policies (Bromberg, 2000). Only some studies show that large corporate R&D in aerospace can be differently organized for specific projects (see for example Malhotra et al., 2001). New regulations and a more commercial and entrepreneurial orientation of space activities in the U.S. in recent years is likely to lead to new forms of organization and R&D

Prizes CP---Solves R&D

Prizes solve R&D- 3 reasons:

A. Encourage Simplicity

Kay ’10 (Luciano, School of public policy @ GT, Technology R&D in the context of innovation inducement prizes Insights from the Google Lunar X Prize, PFD, http://www.spp.gatech.edu/faculty/WOPRpapers/Kay.WOPR10.2.pdf) JL

First, this paper considers the relationship between the characteristics of prize technologies and the time constraint. In aerospace development, simpler designs decrease the probability of facing - 6 - technical problems because there are fewer components and less complex interrelations between them, and the probability of detecting a problem before significant damages is much higher. In the context of prizes, assuming that the goal of teams is to win the competition, simpler designs may represent the shortest path to achieve the prize challenge considering the fixed deadline and the more or less prespecified technology challenge. According to that, technical simplicity is likely to be the most important design criterion. Teams may also draw upon already existing designs or technologies to save additional development time in their projects. Proposition 1: Limited amount of time for technology development leads to simpler designs and reliance upon existing designs or standard technologies.

B. Cost efficient technologies

Kay ’10 (Luciano, School of public policy @ GT, Technology R&D in the context of innovation inducement prizes Insights from the Google Lunar X Prize, PFD, http://www.spp.gatech.edu/faculty/WOPRpapers/Kay.WOPR10.2.pdf) JL

Second, this paper considers the relationship between resources and the budget constraint. One of the main characteristics of prizes is that they do not provide upfront funding to find solutions to the prize challenge. This may have significant implications for prizes linked to aerospace technologies. Aerospace projects have become increasingly complex and expensive, to the point that no one firm can afford to tackle space exploration projects alone (Bugos & Boyd, 2008). Moreover, the GLXP rules require teams to be mostly privately funded (90 percent of the project has to be privately funded,) pushing teams to either seek funding from investors or gather as much resources as possible from alternative sources. Previous research on aerospace prizes has observed how teams draw extensively upon volunteer effort to work on their projects (Kay, 2010). This paper looks at the volunteer effort and other forms of external resources as well, such as funding from investors and partnerships with other organizations to account for both monetary and in-kind contributions. For this research, volunteer effort is defined as sporadic or irregular collaborations of individuals with the prize teams. Proposition 2: A lack of upfront funding leads to increasing diversity of sources to - 7 - gather external resources

C. No Bureaucracy

Kay ’10 (Luciano, School of public policy @ GT, Technology R&D in the context of innovation inducement prizes Insights from the Google Lunar X Prize, PFD, http://www.spp.gatech.edu/faculty/WOPRpapers/Kay.WOPR10.2.pdf) JL

Third, this paper considers the relationship between technology characteristics and R&D organization. Teams are likely to adopt different forms of organization to respond to the prize challenge. An interesting feature of prizes is that they can reduce bureaucratic and accounting barriers that accompany typical grant and contracting processes (Newell & Wilson, 2005), which allows teams to pursue alternative approaches to R&D organization. On the other hand, considering aerospace activity in particular, if teams are only targeting the prize, they do not need to (or cannot) create an entire organization and infrastructure to pursue multiple projects. In other words, while teams face a significant technical challenge, they lack the ―traditional‖ infrastructure used for this kind of projects. Therefore, this research introduces a third proposition to explore the relationship between the characteristics of the technology that teams develop and their forms of R&D organization. Proposition 3: The organization of team R&D activities determines the general characteristics of the prize technologies.

Prizes CP---Private Sector Net-Benefit

Prizes increase investment by the private industry

NASA Academy ’08 (NASA Academy, ROADMAP TO A SPACE FARING CIVILIZATION, http://www.eng.buffalo.edu/~cheetham/index\_files/NA08\_GSFC\_RSFC\_VER\_1.0.pdf) JL

Community and public outreach events like the X PRIZE Cup are catalysts to the commercialization of space because they energize the public and generate support for the industry. The X PRIZE Cup is a space expo that was started in 2004 where airplanes and rockets fly together for crowds of up to 85,000 people (79). These types of events can be considered catalysts because they involve the public in the industry. The public becomes thrust into the action of the emerging technology scene for the Space Industry, and their interest is peaked. The public‟s intensified interest is critical because the more excited the public is about space, the more stable the market will become, and the more investment there will be by private industry.

Prizes allow Private sector to flourish and expand

NASA Academy ’08 (NASA Academy, ROADMAP TO A SPACE FARING CIVILIZATION, http://www.eng.buffalo.edu/~cheetham/index\_files/NA08\_GSFC\_RSFC\_VER\_1.0.pdf) JL

A major catalyst for the involvement of private companies is the contests and challenges presented by the X PRIZE Foundation and NASA. With these challenges hype is generated and money is poured into the space industry through private investors, universities and small companies as they compete to be the first to develop the technology and complete the challenge. The Ansari X Prize for example featured a $10 million prize for a spacecraft that was capable of carrying the weight of three people to 100 km above the Earth‟s surface, twice in two weeks. For this prize the 26 teams competing spent a combined total of over $100 million, which is ten times the prize value (11). Also, since the prize has been won by Scaled Composites with SpaceShipOne, over $1.5 billion dollars in public and private spending has occurred for development of the private spaceflight industry (11). This prize alone developed by the X PRIZE Foundation shows how invaluable these contests and challenges are to the development of the private sector. The challenges presented by the X PRIZE Foundation allowed many new companies to form and allowed small existing companies like Armadillo Aerospace and Scaled Composites to develop technology products without having to compete against well established Aerospace giants like Lockheed Martin, Northrop Grumman and Boeing. X PRIZEs allow the industry to grow and flourish so that there will no longer just be three of four large companies that run the private sector.

Prizes CP---AT: Perm---Government Involvement Bad

Prizes Side step bureaucratic processes

Schroeder ’04 (Alex, analyst for the independence institute, The Application and Administration of Inducement Prizes in Technology, http://www.i2i.org/articles/IP\_11\_2004.pdf) JL

Both recognition and inducement prizes seek to reward an individual or team for a breakthrough in a given field. These prizes have the option of rewarding advances in traditional thinking or the development of nontraditional thinking. This freedom plays a major advantage when weighing the potential methods employed to attain a prize. The vast audience that a prize competition allows for increases the possibility of non-traditional ideas to be proven more effective. Specifically, inducement prizes sidestep the bureaucratic approval often necessary to gain grant and project funding. Since prizes do not discriminate against the ideas that are involved in achieving a certain technological breakthrough a new methodology is free to gain otherwise unlikely exposure. These new ideas often spark public interest and media attention creating yet another benefit of prizes.

Government Agencies are restricted, unlike contestants

Davidian ’04 (Ken, Member of DMG Associates, private company under contract to NASA, Prizes, Prize Culture, and NASA’s Centennial Challenges, http://www.ip.nasa.gov/documents/prize\_culture\_report.pdf) JL

Members of a traditional government contract or grant selection board will typically not select non-standard, non-traditional, innovative, or risky proposals for many legitimate reasons, including responsible stewardship of tax-payers' money and the impact a project’s potential failure would have on future funding, as well as the proposed approach being too far outside the reviewer's experience base. Throughout history, many prize winners have demonstrated a great ability to imagine, build, and demonstrate technologies that were “non-traditional,” including John Harrison (solving what was thought to be an astronomical problem with a mechanical timepiece solution), Louis Blériot (before his successful “No. 11” aeroplane design, his first ten designs can only be described as “creative”), Paul MacCready (with his human-powered Gossamer Condor and Gossamer Albatross), and Burt Rutan (with demo

\*\*\* Other CP Ideas \*\*\*

Incentives CP Solvency

Aerospace industry struggling-incentives key to rehabilitation

AIAA ’10 (American Institute of Aeronautics and Astronautics (AIAA) is the world's largest technical society dedicated to the global aerospace profession., RECRUITING, RETAINING, AND DEVELOPING A WORLD-CLASS AEROSPACE WORKFORCE: An AIAA Information Paper, https://info.aiaa.org/SC/PMEC/Lists/Training%20and%20Workforce%20Development%20Information/Attachments/1/Retaining%20Aero%20Workforce%20031309%20v02.pdf) JL

The American Institute of Aeronautics and Astronautics (AIAA) is extremely concerned about the need to maintain and enhance a strong aerospace workforce, without which the United States would lose invaluable economic and national security benefits. Since aerospace constitutes about $200 billion (or 1.5%) to the domestic economy, and in 2007 delivered a $56 billion positive trade balance, it is critical during the current uncertain economic climate to keep this sector healthy and growing. AIAA provides this informational paper to raise awareness of the unique criticality of workforce issues in the aerospace industry and stimulate discussion in Congress about measures to maintain US leadership and excellence in this important strategic industry. ISSUE Without a strong aerospace workforce, the United States will lose the resulting economic and national security benefits. Incentives are needed for industry to invest in domestic aerospace workforce development, and for U.S. students to choose an engineering career. Barriers to employing talented foreign nationals must also be removed. BACKGROUND