1AC – Inherency

There is no funding for a one-way mission in the status quo

Kaufman, Washington Post Writer, 11

(Marc, Vancouver Sun, 5-25-11, “Would you go to Mars, knowing you’d (probably) never come back?”, http://www.vancouversun.com/technology/Would+Mars+knowing+probably+never+come+back/4838656/story.html, accessed 6-1-11, JG)

"**Our initial goal was to find a way to develop a human mission to Mars that could actually take place**, that wouldn't cost so much that it would be impossible to pull off," Davies said. "**And the one-way trip**, as we costed it out, **would be about one-quarter the price of a there-and-back mission**." "But the response told us the spirit of exploration remains alive around the globe and that some people understand that the science involved would be extraordinary," he said. "Just like with earlier explorers, they are prepared to set out knowing they won't come back, but willing to do it because their time on Mars would be so remarkable." **The idea**, which **is clearly not what NASA managers have in mind** for Mars exploration, has now led to the release of "A One Way Mission to Mars: Colonizing the Red Planet," a compilation of articles from the Journal of Cosmology, plus some additions from scientists with the Mars Society and others. Among the articles in the book are "The Search for Life on Mars," "Medical Care for a Martian Transit Mission and Extended Stay on the Martian Surface" and "Sex on Mars: Pregnancy, Fetal Development and Sex in Outer Space." The authors include dozens of NASA researchers, some former astronauts and some scientists and advocates who have pushed for decades (with no success) for a human mission to Mars. **The whole effort**, authors say, **is geared to sparking public interest in a human mission to Mars, something long discussed by NASA and others but receding into the distance with diminished NASA budgets expected in the years ahead.**

1AC – Colonization (1/7)

Mars colonization efforts key—everywhere else fails: multiple warrants.

**Zubrin 97** (Robert, 1997, Aerospace engineer, president of Mars Society and Pioneer Astronautics, “The Viability of Colonizing Mars”, [http://www.aleph.se/Trans/Tech/Space/mars.html) AH](http://www.aleph.se/Trans/Tech/Space/mars.html)AH)

Among extraterrestrial bodies in our solar system, **Mars is unique in that it possesses all the raw materials required to support not only life, but a new branch of human civilization. This uniqueness is illustrated most clearly if we contrast Mars with the Earth's Moon,** the most frequently cited alternative location for extraterrestrial human colonization. In contrast to the Moon, **Mars is rich in carbon, nitrogen, hydrogen and oxygen, all in biologically readily accessible forms such as CO2 gas, nitrogen gas, and water ice and permafrost. Carbon, nitrogen, and hydrogen are only present on the Moon in parts per million quantities, much like gold in sea water**. Oxygen is abundant on the Moon, but only in tightly bound oxides such as SiO2, Fe2O3, MgO, and Al2O3, which require very high energy processes to reduce. Current knowledge indicates that **if Mars were smooth and all it's ice and permafrost melted into liquid water, the entire planet would be covered with an ocean over 100 meters deep**. This contrasts strongly with the Moon, which is so dry that if concrete were found there, Lunar colonists would mine it to get the water out. Thus, if plants were grown in greenhouses on the Moon ( a very difficult proposition, as we shall see) most of their biomass material would have to be imported. **The Moon is also deficient in about half the metals (for example copper) of interest to industrial society, as well as many other elements of interest such as sulfur and phosphorus. Mars has every required element in abundance. Moreover, on Mars, as on Earth, hydrologic and volcanic processes have occurred, which is likely to have concentrated various elements into local concentrations of high-grade mineral ore.** Indeed, the geologic history of **Mars has been compared with that of Africa7, with very optimistic inferences as to its mineral wealth implied as a corollary**. In contrast, **the Moon has had virtually no history of water or volcanic action, with the result that it is basically composed of trash rocks** with very little differentiation into ores that represent useful concentrations of anything interesting. **But the biggest problem with the Moon, as with all other airless planetary bodies and proposed artificial free-space colonies** (such as those proposed by Gerard O'Neill8) is **that sunlight is not available in a form useful for growing crops**. This is an extremely important point and it is not well understood. **Plants require an enormous amount of energy for their growth, and it can only come from sunlight.** For example a single square kilometer of cropland on Earth is illuminated with about 1000 MW of sunlight at noon; a power load equal to an American city of 1 million people. Put another way, **the amount of power required to generate the sunlight falling on the tiny country of El Salvador exceeds the combined capacity of every power plant on Earth**. Plants can stand a drop of perhaps a factor of 5 in their light intake compared to terrestrial norms and still grow, but the fact remains; the energetics of plant growth make it inconceivable to raise crops on any kind of meaningful scale with artificially generated light. That said, **the problem with using the natural sunlight available on the Moon or in space is that it is unshielded by any atmosphere. (The Moon has an additional problem with its 28 day light/dark cycle, which is also unacceptable to plants). Thus plants grown in a thin walled greenhouse on the surface of the Moon or an asteroid would be killed by solar flares. In order to grow plants safely in such an environment, the walls of the greenhouse would have to be made of glass 10 cm thick**, a construction requirement that would make the development of significant agricultural areas prohibitively expensive. **Use of reflectors and other light-channeling devices would not solve this problem, as the reflector areas would have to be enormous, essentially equal in area to the crop domains**, creating preposterous engineering problems if any significant acreage is to be illuminated. **Mars, on the other hand, has an atmosphere of sufficient density to protect crops grown on the surface against solar flares**. On Mars, even during the base building phase, **large inflatable greenhouses made of transparent plastic protected by thin hard-plastic ultra-violet and abrasion resistant geodesic domes could be readily deployed, rapidly creating large domains for crop growth**. Even without the problems of solar flares and a month-long diurnal cycle, such simple greenhouses would be impractical on the Moon as they would create unbearably high temperatures. **On Mars, in contrast, the strong greenhouse effect created by such domes would be precisely what is necessary to produce a temperate climate inside. Even during the base building phase, domes of this type up to 50 meters in diameter could be deployed on Mars that could contain the 5 psi atmosphere necessary to support humans**. If made of high strength plastics such as Kevlar, such a dome could have a safety factor of 4 against burst and weigh only about 4 tonnes, with another 4 tonnes required for its unpressurized Plexiglas shield. In the early years of settlement, such domes could be imported pre-fabricated from Earth. Later on they could be manufactured on Mars, along with larger domes (with the mass of the pressurized dome increasing as the cube of its radius, and the mass of the

1AC – Colonization (2/7)

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Unpressurized shield dome increasing as the square of the radius: 100 meter domes would mass 32 tonnes and need a 16 tonne Plexiglas shield, etc.). Networks of such 50 to 100 meter domes could rapidly be manufactured and deployed, opening up large areas of the surface to both shirtsleeve human habitation and agriculture. If agriculture only areas are desired, the domes could be made much bigger, as plants do not require more than about 1 psi atmospheric pressure. Once Mars has been partially terraformed however, with the creation of a thicker CO2 atmosphere via regolith outgassing, the habitation domes could be made virtually to any size, as they would not have to sustain a pressure differential between their interior and exterior. The point, however, is that in contrast to colonists on any other known extraterrestrial body, **Martian colonists will be able to live on the surface, not in tunnels, and move about freely and grow crops in the light of day. Mars is a place where humans can live and multiply to large numbers, supporting themselves with products of every description made out of indigenous materials. Mars is thus a place where an actual civilization, not just a mining or scientific outpost, can be developed. And significantly for interplanetary commerce, Mars and Earth are the only two locations in the solar system where humans will be able to grow crops for export**.

And, now is uniquely key—multiple extinction scenarios mean get off the rock.

**Popular Science 11** (March, “AFTER EARTH: Why? Where? How? When?” Pg. 46 Vol. 278 No. 3) NS 5/24/1

Earth won't always be fit for occupation. We know that **in two billion years or so, an expanding sun will boil away our oceans, leaving our home in the universe uninhabitable**-unless, **that is, we haven't already been wiped out by the Andromeda galaxy, which is on a multibillion-year collision course with our Milky Way**. Moreover, **at least a third of the thousand mile-wide asteroids that hurtle across our orbital path will eventually crash into us, at a rate of about one every 300,000 years**. Indeed, **in 1989 a far smaller asteroid**, the impact of which **would** still **have been equivalent in force to 1,000 nuclear bombs, crossed our orbit just six hours after Earth had passed**. A recent report by the Lifeboat Foundation, whose hundreds of researchers track a dozen different existential risks to humanity, likens that onein- 300,000 chance of a catastrophic strike to a game of Russian roulette: "If we keep pulling the trigger long enough we'll blow our head off, and there's no guarantee it won't be the next pull." **Many of the threats that might lead us to consider off-Earth living arrangements are actually manmade, and not necessarily in the distant future. The amount we consume each year already far outstrips what our planet can sustain, and the World Wildlife Fund estimates that by 2030 we will be consuming two planets' worth of natural resources annually**. The Center for Research on the Epidemiology of Disasters, an international humanitarian organization, reports **that the onslaught of droughts, earthquakes, epic rains and floods over the past decade is triple the number from the 1980s and nearly 54 times that of 1901**, when this data was first collected. Some **scenarios have climate change leading to severe water shortages, the submersion of coastal areas, and widespread famine**. Additionally, **the world could end by way of deadly pathogen, nuclear war or**, as the Lifeboat Foundation warns, **the "misuse of increasingly powerful technologies." Given the risks humans pose to the planet, we might also someday leave Earth simply to conserve it**, with our planet becoming a kind of nature sanctuary that we visit now and again, as we might Yosemite. **None of the threats we face are especially far-fetched. Climate change is already a major factor in human affairs, for instance, and our planet has undergone at least one previous mass extinction as a result of asteroid impact.** "The dinosaurs died out because they were too stupid to build an adequate spacefaring civilization," says Tihamer Toth-Fejel, a research engineer at the Advanced Information Systems division of defense contractor General Dynamics and one of 85 members of the Lifeboat Foundation's space-settlement board. "So far, the difference between us and them is barely measurable." The Alliance to Rescue Civilization, a project started by New York University chemist Robert Shapiro, contends that **the inevitability of any of several cataclysmic events means that we must prepare a copy of our civilization and move it into outer space and out of harm's way-a backup of our cultural achievements and traditions**. In 2005, then-NASA administrator Michael Griffin described the aims of the national space program in similar

1AC – Colonization (3/7)

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terms. "If we humans want to survive for hundreds of thousands or millions of years, **we must ultimately populate other planets**," he said. "One day, I don't know when that day is, but there will be more human beings who live off the Earth than on it."

((((INSERT DEATHSTROID UNIQUENESS))))

**And, asteroids pose a unique threat now that must be categorically evaluated before all else.**

**Chichilnisky and Eisenberger 10** (Graciela and Peter, Chichilnisky has a masters and PhD in Math from MIT and UC Berkeley and a PhD in economics from Berkeley and is a statistics professor at Columbia University while Eisenberger has taught physics at princeton and Earth and environmental sciences at Columbia University, “Asteroids: Assessing Catastrophic Risks,” *Journal of Probability and Statistics,* Volume: 2010, May 9, page 2, SRF).

The purpose of this paper is to provide answers to these questions. **We examine** systematically **how to deal with catastrophic risks such as asteroid impacts, which are small probability events with enormous consequences, events that could threaten the survival of our species, and compare their treatment with risks like global warming that are** more imminent and familiar but possibly **less catastrophic**. The task is not easy. **Classic tools for risk management are notoriously poor for managing catastrophic risks**, \_see Posner \_2\_ and Chichilnisky \_3, 4\_\_. **There is** an understandable **tendency to ignore rare events, such as an asteroid impact**, which are unlikely to occur in our lifetimes or those of our families \_2, 5\_. Yes **this is a questionable instinct at this stage of human evolution where our knowledge enables to identify such risks**. Standard decision tools make this task difficult. We show using the existing data that a major disturbance caused by global warming of less than 1% of GDP overwhelms in expected value the costs associated with an asteroid impact that can plausibly lead to the extinction of the human species. We show that the expected value of the loss caused by an asteroid that leads to extinction—is between $500 million and $92 billion. A loss of this magnitude is smaller than that of a failure of a single atomic plant—the Russians lost more than $140 billion with the accident at Chernobyl—or with the potential risks involved in global warming that is between $890 billion and $9*.*7 trillion \_2\_. Using expected values therefore we are led to believe that preventing asteroid impacts should not rank high in our policy priorities. Common sense rebels against the computation we just provided. The ability to anticipate and plan for threats that have never been experienced by any current or past member of the species and are unlikely to happen in our lifespans, appears to be unique to our species. **We need to use a risk management approach that enables us to deal more effectively with such threats** \_2\_. To overcome this problem this paper summarizes a new axiomatic approach to catastrophic risks that updates current methods developed initially by John Von Neumann, see Chichilnisky \_3, 4, 6–9\_, and offers practical figures to evaluate possible policies that would protect us from asteroid impacts**. Our conclusion is that we are underinvesting in preventing the risk of asteroid like threats**. **Much can and should be done at a relatively small cost**; this paper suggests a methodology and a range of dollar values that should be spent to protect against such risks to help prevent the extinction of our species.

1AC – Colonization (4/7)

Scenario two is the environment: First, sun radiation will destroy the Earth—only colonization solves sustainable living and extinction.

**Mitchell and Staretz 10** (Edgar D., ScD. in Aeronautics and Astronautics and lunar module pilot of Apollo 14 and Robert, M.S., as Executive Director of Quantrek, October-November, Journal of Cosmology, “Our Destiny—A Space-Faring Civilization?, journalofcosmoogy.com/Mars104.html, CH)

This is an historic time for humanity and also one of the most challenging times as well. **We stand on the threshold of becoming a space faring civilization** shedding the bonds that have tied us to Earth since the very beginnings of the planet’s history. In the last 40 years, we have looked back at Earth from space, walked on our moon, sent robotic probes to most of the planets, moons and even some of the asteroids of our solar system. We have explored the depths of our galaxy and the visible universe with both Earth and spaced based telescopes and instrumentation. Later this century we will very likely walk on the surface of another planet. Why? Humanity has always had an insatiable appetite to know, for adventure and a remarkable curiosity to explore the unknown. In spite of the sacrifices and challenges required, **history has shown over and over the benefits and rewards of exploration have always far exceeded expectations and mostly in ways that were impossible to predict. No doubt such will be the case again in the exploration of space**. There are many other reasons to travel to other worlds and beyond besides the urge to explore the unknown. One is the obvious long term motivation to become an inter-stellar space faring civilization. **At some point in the distant future we will have no choice but to leave our home world. Our sun, already a middle aged star, is powered by fusing hydrogen in the nuclear inferno at its core. As the remaining fuel is consumed, the sun will continue to expand in size and with it the intensity of the radiation increasing** at the planets. Already **the sun’s output** is 15% greater than it was a few billion years ago and **eventually** it **will destroy all life on the planet**. The long term prognosis is that **the sun will expand to such a large degree that in due course it will cause our oceans to boil away into the vacuum of space leaving an uninhabitable desert wasteland behind. More immediate concerns** for inter-planetary travel but perhaps less well known by most of humanity **are** the issues associated with **insuring a sustainable future for our civilization.** Much of our planet’s non renewable resources such as **ores and precious metals will not last forever** especially with our already large and exponentially growing population**. Mining and refining these ores in space for shipment to Earth will be necessary within short order if we are to maintain and broaden our current standard of living** on the planet**. Establishment of space colonies will** also **teach us much about sustainability issues and many will have direct applicability to the future of Earth.** Until now our planet has had a thriving ecosystem because nature has long ago evolved and fine tuned Earth’s biogeochemical processes to maintain its long term stability. That stability is now being threatened by our own doing.

**And, environmental disaster makes extinction inevitable either short-term or long-term.**

**Popular Science 11** (March, “AFTER EARTH: Why? Where? How? When?” Pg. 46 Vol. 278 No. 3) NS 5/24/11

Earth won't always be fit for occupation. We know that **in two billion years or so, an expanding sun will boil away our oceans, leaving our home in the universe uninhabitable**-unless, **that is, we haven't already been wiped out by the Andromeda galaxy, which is on a multibillion-year collision course with our Milky Way**. Moreover, **at least a third of the thousand mile-wide asteroids that hurtle across our orbital path will eventually crash into us, at a rate of about one every 300,000 years**. Indeed, **in 1989 a far smaller asteroid**, the impact of which **would** still **have been equivalent in force to 1,000 nuclear bombs, crossed our orbit just six hours after Earth had passed**. A recent report by the Lifeboat Foundation, whose hundreds of researchers track a dozen different existential risks to humanity, likens that onein- 300,000 chance of a catastrophic

1AC – Colonization (5/7)

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strike to a game of Russian roulette: "If we keep pulling the trigger long enough we'll blow our head off, and there's no guarantee it won't be the next pull." **Many of the threats that might lead us to consider off-Earth living arrangements are actually manmade, and not necessarily in the distant future. The amount we consume each year already far outstrips what our planet can sustain, and the World Wildlife Fund estimates that by 2030 we will be consuming two planets' worth of natural resources annually**. The Center for Research on the Epidemiology of Disasters, an international humanitarian organization, reports **that the onslaught of droughts, earthquakes, epic rains and floods over the past decade is triple the number from the 1980s and nearly 54 times that of 1901**, when this data was first collected. Some **scenarios have climate change leading to severe water shortages, the submersion of coastal areas, and widespread famine**. Additionally, **the world could end by way of deadly pathogen, nuclear war or**, as the Lifeboat Foundation warns, **the "misuse of increasingly powerful technologies." Given the risks humans pose to the planet, we might also someday leave Earth simply to conserve it**, with our planet becoming a kind of nature sanctuary that we visit now and again, as we might Yosemite. **None of the threats we face are especially far-fetched. Climate change is already a major factor in human affairs, for instance, and our planet has undergone at least one previous mass extinction as a result of asteroid impact.** "The dinosaurs died out because they were too stupid to build an adequate spacefaring civilization," says Tihamer Toth-Fejel, a research engineer at the Advanced Information Systems division of defense contractor General Dynamics and one of 85 members of the Lifeboat Foundation's space-settlement board. "So far, the difference between us and them is barely measurable." The Alliance to Rescue Civilization, a project started by New York University chemist Robert Shapiro, contends that **the inevitability of any of several cataclysmic events means that we must prepare a copy of our civilization and move it into outer space and out of harm's way-a backup of our cultural achievements and traditions**. In 2005, then-NASA administrator Michael Griffin described the aims of the national space program in similar terms. "If we humans want to survive for hundreds of thousands or millions of years, **we must ultimately populate other planets**," he said. "One day, I don't know when that day is, but there will be more human beings who live off the Earth than on it."

**And, geographic isolation supercharges every impact and makes extinction inevitable in the status quo—plan disperses the species to solve.**

Sowers 2(George F., “The Transhumanist Case for Space” April 2002, <http://www.georgesowers.com/Other_pdf/The_trans_case_for_space.pdf>, accessed 6-9-11, JMB)

**What can we do to maximize our odds of survival**, irrespective of what those odds might actually be? Furthermore, as humans or aspiring transhumans, we desire much more than mere survival. We also wish to grow in our capabilities and enjoy not only continued life but an ever increasing abundance of life. In this light the question becomes one of risk management. How can we best avoid any large-scale events that would either threaten our survival or significantly degrade our quality of life or limit our ability to grow our technology? Risk management is a fairly standard technique practiced in the management of many (if not most) large scale engineering projects, especially those involving significant amounts of technological development. It came of age in the era of the massive nuclear power plant projects10 and has become stock and trade in the aerospace and defense industry.11 The logic of risk management is straightforward. A risk is an event that has consequences adverse to the achievement of the project’s goals. It is quantified by two numbers: the probability of the event and the severity of the consequences. Typically, the severity of the consequences is measured in dollars of additional cost or weeks of schedule delay or some technical measurement of the performance of the system. The risk management process consists of several basic steps. First is risk identification, followed by risk assessment and analysis and finally risk handling. Risk identification involves the recognition of possible future adverse events—events with consequences detrimental to the projects goal’s. Risk assessment and analysis is the process of estimating the probability of occurrence and consequences of the identified events. Since uncertainty is a significant element of risk, a key element of risk analysis is bounding the uncertainties on the estimated probabilities and consequences. Finally, risk handling is determining and executing a set of actions to reduce the overall risk level, the point of risk management. By now you may be wondering what all this has to do with transhumanism and space. The transhumanism agenda can certainly be seen as embodying a set of goals, among them being extended life and mental capabilities for individual humans/transhumans. Furthermore, it is clear that there are possible future events that would severely curtail, or prohibit our ability to achieve those goals. Those events - 10 - constitute risks to the transhumanist movement, and risk management techniques can be applied to mitigate them. My claim here will be that the expansion of humanity into space, colonizing other planets and eventually other solar systems, provides substantial mitigation for the most severe risks facing transhumanists and the human species as a whole. **What kinds of future events should we be worried about?** Nick **Bostrom has taken a credible stab at developing a list**.12 Although he was ostensibly looking at

1AC – Colonization (6/7)

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existential risks—no, not the risk of becoming like Camus, but risks that threaten the existence of the species, risks of extinction—his list is a good starting point for general risks to the transhumanist future. **Among the items he mentions are deliberate or accidental misuse of nano-technology, nuclear holocaust, badly programmed superintelligence, genetically engineered biological agents, and asteroid impact.** We can think of others that don’t have existential consequences but can cause grave harm to transhuman objectives through derailment and delay. For example, anti-technology sentiment generated by religious or environmentalist groups, economic crisis spurred by energy scarcity or regional conflict or simply the chaotic dynamics of economies, global environmental or climatic catastrophe leading to economic crashes—any of these might severely curtail the technological progress necessary for transhumanist aims. Of course, eventually the earth will be consumed by the death of the sun, an event we should have a few billion years to prepare for. So much for risk identification. **You can add your own favorites. Clearly there is no lack of things to worry about.** Next comes risk assessment and analysis. In this phase we attempt to estimate the probability of ocurance and severity of consequences for the identified events. For proper risk assessment, the estimates should include not only a point estimate but also confidence intervals, as the range of possibilities is important to the mitigation planning phase. A detailed assessment of these risks is far beyond the scope of this article, but let me make a few general comments. In order to make the probability estimate precise, we need to specify the time horizon, say the next 100 years or the next 1000 years. For example, we could say that the probability of a significant asteroid strike (greater than x tons) to the earth within the next 100 years is y ±dy to 95% confidence. It happens that the probability of an asteroid strike is perhaps the easiest of all to estimate given the - 11 - available astronomical data. The other events are devilishly hard to get credible numbers for, so we would resort to a relative likelihood. The severity of consequences is again very difficult to predict but would generally range from complete extinction through collapse of civilization to a relatively mild economic downturn. Here it is helpful to devise some common system of measurement in order to facilitate comparison of different risks. For example, each risk could be quantified in terms of the resulting time delay to achieving some transhumanist milestone. In this case, extinction would be tantamount to an infinite delay, where an economic crash might delay things only a few years. The third and final phase of risk management is risk handling or risk mitigation. Standard risk management identifies four risk handling techniques: avoidance, control, assumption, and transfer. Risk avoidance means eliminating the event as a possibility. For example, we could avoid the risk of nano-technology disaster by refusing to pursue nano-technology research. I am not advocating that course of action. Risk control consists of taking actions to either reduce the probability of occurrence or reduce the severity of consequences or both. It is what we traditionally think of as risk mitigation. Risk assumption occurs when we resign ourselves to the fact that a particular risk exists and there is not much we can do about it. Risk transfer is shifting the consequences of the event to someone else and is typically used when considering the financial consequences of an event, i.e., who pays for the disaster. **The** exploration and **colonization of space falls into the category of risk control for the risks we have identified above. To see this it is only necessary to recognize that the effects of these risk events are confined to a particular limited spatial locale**, namely **Earth**. Hence, **distributing the species across space reduces the consequences of such an event to only that portion of the population resident in that particular spot. This phenomenon is well known in biology. If you look at the wide diversity of biological species, the ones at greatest risk for extinction are those who are geographically isolated**. **Most of the modern extinctions have come from species indigenous to one or a handful of islands. Species that are wide spread are far more resilient**. The reasons are simple. **Just one bit of bad luck can wipe out an island species**: the introduction of a new predator, a new more virulent disease, a change of climate, the loss of food sources, etc. **But if a** - 12 - **species is geographically diverse, one of these kinds of events will lead to only local extinction.13 The analogy is straightforward: humanity is on an island called earth. As long as we are confined to this one locale, we are vulnerable to various calamities: nuclear war, bio-terrorism, global warming, asteroid impact, invasion by a super intelligent race, or some nano-tech experiment run amok. Once humanity** or transhumanity **becomes dispersed** among the stars **we become far less exposed to extinction by our own stupidity or just bad luck.**

1AC – Colonization (7/7)

**And, no risk of them winning any terminal defense on Mars--Terraforming is inevitable and solves all their defense.**

**Zubrin 95** (Robert, aerospace engineer at Lockheed Martin and author of numerous books on Mars exploration, “The Economic Viability of Mars Colonization”, <http://www.aleph.se/Trans/Tech/Space/mars.html>, IWren)

If a viable Martian civilization can be established, its population and powers to change its planet will continue to grow. The advantages accruing to such a society of terraforming Mars into a more human-friendly environment are manifest4. Put simply, **if enough people find a way to live and prosper on Mars there is no doubt but that sooner or later they will terraform the planet. The feasibility or lack thereof of terraforming Mars is thus in a sense a corollary to the economic viability of the Martian colonization effort**.  Potential methods of terraforming Mars have been discussed in a number of locations.5,6. **In the primary scenario, artificial greenhouse gases such as halocarbons are produced on Mars and released into the atmosphere. The temperature rise induced by the presence of these gases causes** CO2 adsorbed in the regolith to be outgassed, increasing the **greenhouse effect** still more, causing more outgassing, etc. In reference 6 it was shown that a rate of halocarbon production of about 1000 tonnes per hour would directly induce a temperature rise of about 10 K on Mars, and that the outgassing of CO2 caused by this direct forcing **would likely raise the average temperature on Mars by 40 to 50 K, resulting in a Mars with a surface pressure over 200 mbar and seasonal incidence of** liquid water **in the warmest parts of the planet.** Production of halocarbons at this rate would require an industrial establishment on Mars wielding about 5000 MW or power supported by a division of labor requiring at least (assuming optimistic application of robotics) 10,000 people. **Such an operation would be** enormous compared to our current space efforts, but very small **compared to the overall human economic effort even at present**. It is therefore anticipated that such **efforts could commence as early as the mid 21st Century**, with a substantial amount of the outgassing following on a time scale of a few decades. **While humans could not breath the atmosphere of such a Mars, plants could, and under such conditions increasingly complex types of pioneering vegetation could be disseminated to create soil**, oxygen**, and ultimately the foundation for a thriving ecosphere on Mars**. The presence of substantial pressure, even of an unbreathable atmosphere, would greatly benefit human settlers as only simple breathing gear and warm clothes (i.e. no spacesuits) would be required to operate in the open, and **city-sized inflatable structures could be erected** (since there would be no pressure differential with the outside world) **that could house very large settlements in an open-air shirt-sleeve environment**.  Nevertheless, Mars will not be considered fully terraformed until its air is breathable by humans. Assuming complete coverage of the planet with photosynthetic plants, it would take about a millennia to put the **120 mbar of oxygen in Mars' atmosphere needed to support human respiration** in the open. It is therefore anticipated that **human terraformers would accelerate the oxygenation process by artificial technological approaches** yet to be determined, with the two leading concepts being those **based on either macroengineering** (i.e. direct employment of very large scale energy systems such as terrawatt sized fusion reactors, huge space-based reflectors or lasers, etc.) **or self reproducing machines**, such as Turing machines or nanotechnology. Since such systems are well outside current engineering knowledge it is difficult to provide any useful estimate of how quickly they could complete the terraforming job. However in the case of self-replicating machines the ultimate source of power would be solar, and this provides the basis for an upper bound to system performance. Assuming the whole planet is covered with machines converting sunlight to electricity at 30% efficiency, and all this energy is applied to releasing oxygen from metallic oxides, **a 120 mbar oxygen atmosphere could be created in about 30 years**.

1AC – Leadership (1/5)

The US maintains leadership in space, but lack of funding and global rivalries threaten dominance

Kauffman 8

Mark, Washington Post, “US Finds It’s Getting Crowded Out There”, 7-9-08, http://www.washingtonpost.com/wp-dyn/content/article/2008/07/08/AR2008070803185.html, CH

China plans to conduct its first spacewalk in October. The European Space Agency is building a roving robot to land on Mars. India recently launched a record 10 satellites into space on a single rocket. Space, like Earth below, is globalizing. And as it does, America's long-held superiority in exploring, exploiting and commercializing "the final frontier" is slipping away, many experts believe. Although the United States remains dominant in most space-related fields -- and owns half the military satellites currently orbiting Earth -- experts say the nation's superiority is diminishing, and many other nations are expanding their civilian and commercial space capabilities at a far faster pace. "We spent many tens of billions of dollars during the Apollo era to purchase a commanding lead in space over all nations on Earth," said NASA Administrator Michael D. Griffin, who said his agency's budget is down by 20 percent in inflation-adjusted terms since 1992. "We've been living off the fruit of that purchase for 40 years and have not . . . chosen to invest at a level that would preserve that commanding lead."

Only quick starting one-way missions able to maintain scientific leadership.

Tyson ’10 (Peter, 4/11/10, PBS Nova, “A One Way Trip To Mars?”) SW

Even in 50 years, Davies suspects, neither the financial nor the political wherewithal will exist to send astronauts to Mars to poke around for a short time and then whisk them home again, as we did with the Apollo astronauts. By 2012, Russia expects to launch a robotic mission to the Mars moon Phobos (seen here in an artist's depiction on a Hungarian stamp). Such missions worry Aldrin, for one, who fears the United States might start falling behind in space exploration. Aldrin worries that if the U.S. doesn't act soon, other countries may end up putting people on the Red Planet sooner than we do. In 2011, Russia plans to send a sample-collecting mission to Phobos, one of the moons of Mars (and, in Aldrin's opinion, the ideal staging point for a colonization of the planet). The so-called Phobos-Grunt mission includes a Chinese satellite. "If we don't shape up what we're doing," Aldrin told me, "we're going to find the Russians clearly leading missions to Mars."

1AC – Leadership (2/5)

US space leadership stems from risky missions and translates to its participation in the international sphere

Stone 11 (March 14, Christopher, Space Strategy Planner at [United States Air Force](http://www.linkedin.com/company/united-states-air-force?trk=ppro_cprof), The Space Review “American leadership in space: leadership through capability” <http://www.thespacereview.com/article/1797/1>) NS 5/26/11

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

1AC – Leadership (3/5)

Space leadership is critical to overall US hegemony- provides intelligence and warfighting capabilities.

Young 8 (Thomas, Chair for the Institute for Defense Analyses Research Group, “Leadership, Management, and Organization for National Security Space”. July 2008. [http://www.armyspace.army.mil/ASJ/Images/National\_Security\_S pace\_Study\_Final\_Sept\_16.pdf](http://www.armyspace.army.mil/ASJ/Images/National_Security_Space_Study_Final_Sept_16.pdf)) AV

Today, U.S. leadership in space provides a vital national advantage across the scientific, commercial, and national security realms. In particular, space is of critical importance to our national intelligence and warfighting capabilities. The panel members nevertheless are unanimous in our conviction that, without significant improvements in the leadership and management of NSS programs, U.S. space preeminence will erode to the extent that space ceases to provide a competitive national security advantage. Space technology is rapidly proliferating across the globe, and many of our most important capabilities and successes were developed and fielded with a government technical workforce and a management structure that no longer exist. *U.S. Leadership in Space is a Vital National Advantage* Space capabilities underpin U.S. economic, scientific, and military leadership. The space enterprise is embedded in the fabric of our nation’s economy, providing technological leadership and sustainment of the industrial base. To cite but one example, the Global Positioning System (GPS) is the world standard for precision navigation and timing. Global awareness provided from space provides the ability to effectively plan for and respond to such critical national security requirements as intelligence on the military capabilities of potential adversaries, intelligence on Weapons of Mass Destruction (WMD) program proliferation, homeland security, and missile warning and defense. Military strategy, operations, and tactics are predicated upon the availability of space capabilities.

1AC – Leadership (4/5)

Loss of American dominance creates multiple scenarios for nuclear war.

Kagan, sr. associate@Carnegie Endowment for Peace, 7

(Robert, “End of Dreams; Return of History,” 17 July 2007, Policy Review, No. 144, p. <http://www.hoover.org/publications/policy-review/article/6136#n10>, Accessed: 20 June 2011, JT)

The jostling for status and influence among these ambitious nations and would-be nations is a second defining feature of the new post-Cold War international system. Nationalism in all its forms is back, if it ever went away, and so is international competition for power, influence, honor, and status. American predominance prevents these rivalries from intensifying —  its regional as well as its global predominance. Were the United States to diminish its influence in the regions where it is currently the strongest power, the other nations would settle disputes as great and lesser powers have done in the past: sometimes through diplomacy and accommodation but often through confrontation and wars of varying scope, intensity, and destructiveness. One novel aspect of such a multipolar world is that most of these powers would possess nuclear weapons. That could make wars between them less likely, or it could simply make them more catastrophic. It is easy but also dangerous to underestimate the role the United States plays in providing a measure of stability in the world even as it also disrupts stability. For instance, the United States is the dominant naval power everywhere, such that other nations cannot compete with it even in their home waters. They either happily or grudgingly allow the United States Navy to be the guarantor of international waterways and trade routes, of international access to markets and raw materials such as oil. Even when the United States engages in a war, it is able to play its role as guardian of the waterways. In a more genuinely multipolar world, however, it would not. Nations would compete for naval dominance at least in their own regions and possibly beyond. Conflict between nations would involve struggles on the oceans as well as on land. Armed embargos, of the kind used in World War i and other major conflicts, would disrupt trade flows in a way that is now impossible. Such order as exists in the world rests not merely on the goodwill of peoples but on a foundation provided by American power. Even the European Union, that great geopolitical miracle, owes its founding to American power, for without it the European nations after World War ii would never have felt secure enough to reintegrate Germany. Most Europeans recoil at the thought, but even today Europe ’s stability depends on the guarantee, however distant and one hopes unnecessary, that the United States could step in to check any dangerous development on the continent. In a genuinely multipolar world, that would not be possible without renewing the danger of world war. People who believe greater equality among nations would be preferable to the present American predominance often succumb to a basic logical fallacy. They believe the order the world enjoys today exists independently of American power. They imagine that in a world where American power was diminished, the aspects of international order that they like would remain in place. But that ’s not the way it works. International order does not rest on ideas and institutions. It is shaped by configurations of power. The international order we know today reflects the distribution of power in the world since World War ii, and especially since the end of the Cold War. A different configuration of power, a multipolar world in which the poles were Russia, China, the United States, India, and Europe, would produce its own kind of order, with different rules and norms reflecting the interests of the powerful states that would have a hand in shaping it. Would that international order be an improvement? Perhaps for Beijing and Moscow it would. But it is doubtful that it would suit the tastes of enlightenment liberals in the United States and Europe. The current order, of course, is not only far from perfect but also offers no guarantee against major conflict among the world ’s great powers. Even under the umbrella of unipolarity, regional conflicts involving the large powers may erupt. War could erupt between China and Taiwan and draw in both the United States and Japan. War could erupt between Russia and Georgia, forcing the United States and its European allies to decide whether to intervene or suffer the consequences of a Russian victory. Conflict between India and Pakistan remains possible, as does conflict between Iran and Israel or other Middle Eastern states. These, too, could draw in other great powers, including the United States. Such conflicts may be unavoidable no matter what policies the United States pursues. But they are more likely to erupt if the United States weakens or withdraws from its positions of regional dominance. This is especially true in East Asia, where most nations agree that a reliable American power has a stabilizing and pacific effect on the region. That is certainly the view of most of China ’s neighbors. But even China, which seeks gradually to supplant the United States as the dominant power in the region, faces the dilemma that an American withdrawal could unleash an ambitious, independent, nationalist Japan. In Europe, too, the departure of the United States from the scene — even if it remained the world’s most powerful nation — could be destabilizing. It could tempt Russia to an even more overbearing and potentially forceful approach to unruly nations on its periphery.

[Kagan Continued on next page…]

1AC – Leadership (5/5)

[Kagan continued…no text removed]

Although some realist theorists seem to imagine that the disappearance of the Soviet Union put an end to the possibility of confrontation between Russia and the West, and therefore  to the need for a permanent American role in Europe, history suggests that conflicts in Europe involving Russia are possible even without Soviet communism. If the United States withdrew from Europe — if it adopted what some call a strategy of “offshore balancing” — this could in time increase the likelihood of conflict involving Russia and its near neighbors, which could in turn draw the United States back in under unfavorable circumstances. It is also optimistic to imagine that a retrenchment of the American position in the Middle East and the assumption of a more passive, “offshore” role would lead to greater stability there. The vital interest the United States has in access to oil and the role it plays in keeping access open to other nations in Europe and Asia make it unlikely that American leaders could or would stand back and hope for the best while the powers in the region battle it out. Nor would a more “even-handed” policy toward Israel, which some see as the magic key to unlocking peace, stability, and comity in the Middle East, obviate the need to come to Israel ’s aid if its security became threatened. That commitment, paired with the American commitment to protect strategic oil supplies for most of the world, practically ensures a heavy American military presence in the region, both on the seas and on the ground. The subtraction of American power from any region would not end conflict but would simply change the equation. In the Middle East, competition for influence among powers both inside and outside the region has raged for at least two centuries. The rise of Islamic fundamentalism doesn ’t change this. It only adds a new and more threatening dimension to the competition, which neither a sudden end to the conflict between Israel and the Palestinians nor an immediate American withdrawal from Iraq would change. The alternative to American predominance in the region is not balance and peace. It is further competition. The region and the states within it remain relatively weak. A diminution of American influence would not be followed by a diminution of other external influences. One could expect deeper involvement by both China and Russia, if only to secure their interests. [18](http://www.hoover.org/publications/policy-review/article/6136" \l "n18) And one could also expect the more powerful states of the region, particularly Iran, to expand and fill the vacuum. It is doubtful that any American administration would voluntarily take actions that could shift the balance of power in the Middle East further toward Russia, China, or Iran. The world hasn ’t changed that much. An American withdrawal from Iraq will not return things to “normal” or to a new kind of stability in the region. It will produce a new instability, one likely to draw the United States back in again. The alternative to American regional predominance in the Middle East and elsewhere is not a new regional stability. In an era of burgeoning nationalism, the future is likely to be one of intensified competition among nations and nationalist movements. Difficult as it may be to extend American predominance into the future, no one should imagine that a reduction of American power or a retraction of American influence and global involvement will provide an easier path.

1AC – Solvency (1/3)

Have the tech- Falcon 9 heavy rocket can get us there

Zubrin, President of Pioneer Astronautics and of the Mars Society, 11,

(Robert, Wall Street Journal, “How We Can Fly to Mars in This Decade—And on the Cheap”, http://online.wsj.com/article/SB10001424052748703730804576317493923993056.html?mod=googlenews\_wsj, accessed 5-31-11, JG)

SpaceX, **a private firm that develops rockets and spacecraft, recently announced it will field a heavy lift rocket within two years that can deliver more than twice the payload of any booster now flying**. This poses a thrilling question: Can we reach Mars in this decade? It may seem incredible—since conventional presentations of human Mars exploration missions are filled with depictions of gigantic, futuristic, nuclear-powered interplanetary spaceships whose operations are supported by a virtual parallel universe of orbital infrastructure. There's nothing like that on the horizon. But I believe **we could reach Mars with the tools we have or soon will. Here's how: SpaceX's Falcon-9 Heavy rocket will have a launch capacity of 53 metric tons to low Earth orbit. This means that if a conventional hydrogen-oxygen chemical rocket upper stage were added, it could send 17.5 tons on a trajectory to Mars, placing 14 tons in Mars orbit, or landing 11 tons on the Martian surface**. The company has also developed a crew capsule, known as the Dragon, which has a mass of about eight tons. While its current intended mission is to ferry up to seven astronauts to the International Space Station, the Dragon's heat shield system is capable of withstanding re-entry from interplanetary trajectories, not just from Earth orbit. It is rather small for an interplanetary spaceship, but it is designed for multiyear life, and it should be spacious enough for two astronauts with the right stuff. **Thus a Mars mission could be accomplished** with three Falcon-9 Heavy launches. One would deliver to Mars orbit an unmanned Dragon capsule with a kerosene/oxygen chemical rocket stage of sufficient power to drive it back to Earth. This is the Earth Return Vehicle. A second launch would deliver to the Martian surface an 11-ton payload consisting of a two-ton Mars Ascent Vehicle employing a single methane/oxygen rocket propulsion stage, a small automated chemical reactor system, three tons of surface exploration gear, and a 10-kilowatt power supply, which could be either nuclear or solar. The Mars Ascent Vehicle would carry 2.6 tons of methane in its propellant tanks, but not the nine tons of liquid oxygen required to burn it. Instead, the oxygen could be made over a 500-day period by using the chemical reactor to break down the carbon dioxide that composes 95% of the Martian atmosphere. Using technology to generate oxygen rather than transporting it saves a great deal of mass and provides power and unlimited oxygen once the crew arrives. The third launch would then send a Dragon capsule with two astronauts to Mars. The capsule would carry 2,500 kilograms of consumables—sufficient, if water and oxygen recycling systems are employed, to support the two-person crew for up to three years. Given the payload capacity, a light ground vehicle and several hundred kilograms of science instruments could be taken along as well. **The crew would reach Mars in six months** and land their Dragon capsule near the Mars Ascent Vehicle. They would spend the next year and a half exploring. Using their ground vehicle for mobility and the Dragon as home and laboratory, they could search the Martian surface for fossil evidence of life that may have existed when the Red Planet featured standing bodies of water. They could also assemble drilling rigs to bring up samples of subsurface water, within which native microbial life may persist. Finding either would prove that life is not unique to Earth, answering a question that mankind has wondered about for millennia. At the end of their 18-month stay, the crew would transfer to the Mars Ascent Vehicle, take off and rendezvous with the Earth Return Vehicle in orbit. This craft would then take them on a six-month flight back to Earth, splashing down to an ocean landing. **Nothing in this plan is beyond our current technology, and the costs would not be excessive. Falcon-9 Heavy launches are priced at about $100 million each, and Dragons are cheaper. With this approach, we could send expeditions to Mars at half the cost to launch a Space Shuttle flight**. There is no question that this plan involves considerable risk, and a variety of missions, technology developments and testing programs in advance might reduce that risk.

1AC – Solvency (2/3)

One-way to Mars is cheap, quick, survivable, technologically feasible, and key to stopping extinction of the human race.

Geranios ’10 (Nicholas, MSNBC, 11/15/2010, “Scientists propose one-way trips to Mars”, http://www.msnbc.msn.com/id/40194872/ns/technology\_and\_science-space/t/scientists-propose-one-way-trips-mars/) SW

Invoking the spirit of "Star Trek" in a scholarly article entitled "To Boldly Go," two scientists contend human travel to Mars could happen much more quickly and cheaply if the missions are made one-way. They argue that it would be little different from early settlers to North America, who left Europe with little expectation of return. "The main point is to get Mars exploration moving," said Dirk Schulze-Makuch of Washington State University, who wrote the article in the latest "Journal of Cosmology" with Paul Davies of Arizona State University. The colleagues state — in one of 55 articles in the issue devoted to exploring Mars — that humans must begin colonizing another planet as a hedge against a catastrophe on Earth. Mars is a six-month flight away, possesses surface gravity, an atmosphere, abundant water, carbon dioxide and essential minerals. They propose the missions start by sending two two-person teams, in separate ships, to Mars. More colonists and regular supply ships would follow. The technology already exists, or is within easy reach, they wrote. An official for NASA said the space agency envisions manned missions to Mars in the next few decades, but that the planning decidedly involves round trips. President Obama informed NASA last April that he "`believed by the mid-2030s that we could send humans to orbit Mars and safely return them to Earth. And that a landing would soon follow,'" said agency spokesman Michael Braukus. No where did Obama suggest the astronauts be left behind. "We want our people back," Braukus said. Retired Apollo 14 astronaut Ed Mitchell, who walked on the Moon, was also critical of the one-way idea. "This is premature," Mitchell wrote in an e-mail. "We aren't ready for this yet." Davies and Schulze-Makuch say it's important to realize they're not proposing a "suicide mission." "The astronauts would go to Mars with the intention of staying for the rest of their lives, as trailblazers of a permanent human Mars colony," they wrote, while acknowledging the proposal is a tough sell for NASA, with its intense focus on safety. They think the private sector might be a better place to try their plan. "What we would need is an eccentric billionaire," Schulze-Makuch said. "There are people who have the money to put this into reality." Indeed, British tycoon Richard Branson, PayPal founder Elon Musk and Amazon.com Inc. CEO Jeff Bezos are among the rich who are involved in private space ventures. Isolated humans in space have long been a staple of science fiction movies, from "Robinson Crusoe on Mars" to "2001: A Space Odyssey" to a flurry of recent movies such as "Solaris" and "Moon." In many of the plots, the lonely astronauts fall victim to computers, madness or aliens. Psychological profiling and training of the astronauts, plus constant communication with Earth, will reduce debilitating mental strains, the two scientists said. "They would in fact feel more connected to home than the early Antarctic explorers," according to the article. But the mental health of humans who spent time in space has been extensively studied. Depression can set in, people become irritated with each other, and sleep can be disrupted, the studies have found. The knowledge that there is no quick return to Earth would likely make that worse. Davies is a physicist whose research focuses on cosmology, quantum field theory, and astrobiology. He was an early proponent of the theory that life on Earth may have come from Mars in rocks ejected by asteroid and comet impacts. Schulze-Makuch works in the Earth Sciences department at WSU and is the author of two books about life on other planets. His focus is eco-hydrogeology, which includes the study of water on planets and moons of our solar system and how those could serve as a potential habitat for microbial life. The peer-reviewed Journal of Cosmology covers astronomy, astrobiology, Earth sciences and life. Schulze-Makuch and Davies contend that Mars has abundant resources to help the colonists become self-sufficient over time. The colony should be next to a large ice cave, to provide shelter from radiation, plus water and oxygen, they wrote. They believe the one-way trips could start in two decades. "You would send a little bit older folks, around 60 or something like that," Schulze-Makuch said, bringing to mind the aging heroes who save the day in "Space Cowboys." That's because the mission would undoubtedly reduce a person's lifespan, from a lack of medical care and exposure to radiation. That radiation would also damage human reproductive organs, so sending people of childbearing age is not a good idea, he said. There have been seniors in space, including John Glenn, who was 77 when he flew on the space shuttle in 1998. Still, Schulze-Makuch believes many people would be willing to make the sacrifice. The Mars base would offer humanity a "lifeboat" in the event Earth becomes uninhabitable, they said. "We are on a vulnerable planet," Schulze-Makuch said. "Asteroid impact can threaten us, or a supernova explosion. If we want to survive as a species, we have to expand into the solar system and likely beyond."

1AC – Solvency (3/3)

Only a one-way mission will solve.

Schulze-Makuch, and Davies, environmental science@Washington State, Beyond Center@ASU,10

(Dirk and Paul, “[To Boldly Go: A One-Way Human Mission to Mars](http://www.amazon.com/Human-Mission-Mars-Colonizing-Planet/dp/0982955235/ref=sr_1_3?s=books&ie=UTF8&qid=1287364920&sr=1-3),”Journal of Cosmology, Vol. 12, p. <http://journalofcosmology.com/Mars108.html>, accessed: 20 June 2011, JT)

The exploration of Mars has been a priority for the space programs of several nations for decades, yet the prospect of a manned expedition continually recedes in the face of daunting and well-recognized challenges. The long travel time to Mars in zero gravity and high radiation conditions would impose a serious health burden on the astronauts. The costs of developing the launch vehicle and assembling the large amount of equipment needed for the astronauts to survive the journey and their long sojourn on the Martian surface, together with a need to send all the fuel and supplies for a return journey make a manned Mars expedition at least an order of magnitude more expensive than the Apollo program. In our view, however, many of these human and financial problems would be ameliorated by a one-way mission. It is important to realize that this is not a "suicide mission." The astronauts would go to Mars with the intention of staying for the rest of their lives, as trailblazers of a permanent human Mars colony. They would be resupplied periodically from Earth, and eventually develop some "home grown" industry such as food production and mineral/chemical processing (Zubrin and Baker 1992; Zubrin and Wagner 1997). Their role would be to establish a "base camp" to which more colonists would eventually be sent, and to carry out important scientific and technological projects meanwhile. Of course, the life expectancy of the astronauts would be substantially reduced, but that would also be the case for a return mission. The riskiest part of space exploration is take-off and landing, followed by the exposure to space conditions. Both risk factors would be halved in a one-way mission, and traded for the rigors of life in a cramped and hostile environment away from sophisticated medical equipment. On the financial front, abandoning the need to send the fuel and supplies for the return journey would cut costs dramatically, arguably by about 80 percent. Furthermore, once a Mars base has been established, it would be politically much easier to find the funding for sustaining it over the long term than to mount a hugely expensive return mission.

We can use Mars’ resources for water, fuel, construction, and more. This also means a faster timetable for the colony

Mars Society, No Date (The Mars Society/Dr. Robert Zubrin, no date given [between ’05 and ‘07], “Mars Direct”, <http://www.marssociety.org/home/about/mars-direct>) SW

Mars Direct is a sustained humans-to-Mars plan developed by Dr. Robert Zubrin that advocates a minimalist, live-off-the-land approach to exploring Mars, allowing for maximum results with minimum investment. Using existing launch technology and making use of the Martian atmosphere to generate rocket fuel, extracting water from the Martian soil and eventually using the abundant mineral resources of the Red Planet for construction purposes, the plan drastically lowers the amount of material which must be launched from Earth to Mars, thus sidestepping the primary stumbling block to space exploration and rapidly accelerating the timetable for human exploration of the solar system. The general outline of Mars Direct is simple. In the first year of implementation, an Earth Return Vehicle (ERV) is launched to Mars, arriving six months later. Upon landing, a rover is deployed that contains the reactors necessary to generate rocket fuel for the return trip. After 13 months, a fully-fueled return vehicle will be sitting on the surface of Mars. During the next launch window, 26 months after the ERV was launched, two more craft are sent up: a second ERV and a habitat module (hab), the astronauts' ship. This time the ERV is sent on a low-power trajectory, designed to arrived at Mars in eight months -- so that it can land at the same site as the hab if the first ERV experiences any problems. Assuming that the first ERV works as planned, the second ERV is landed at a different site, thus opening up another area of Mars for exploration by the next crew. After a year and a half on the Martian surface, the first crew returns to Earth, leaving behind the hab, the rovers associated with it and any ongoing experiments conducted there. They land on Earth six months later to a hero's welcome, with the next hab/ERV already on course for Mars. With two launches during each launch window -- one ERV and one hab -- more and more of Mars will be opened to human exploration. Eventually multiple habs can be sent to the same site and linked together, allowing for the beginning of a permanent Mars base.