**Lunar Colonization Neg**

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**1NC Meteors Frontline**

**NASA and Russian scientists agree that it is highly unprobable for Asteroid Apophasis to approach earth – even if it does NASA can easily stop it.**

**Bryner**, Michelle– (writer for MSNBC) **2/11** “Will Asteroid Apophasis Hit Earth in 2036? NASA Rejects Russian Report” – February 2nd, 2011 http://www.msnbc.msn.com/id/41428607/ns/technology\_and\_science-space/t/dont-worry-asteroid-wont-hit-earth-oh-wait/

In 2004, NASA scientists announced that there was a chance that Apophis, an asteroid larger than two football fields, could smash into Earth in 2029. A few additional observations and some number-crunching later, astronomers noted that the chance of the planet-killer hitting Earth in 2029 was nearly zilch. Now, reports out of Russia say that scientists there estimate Apophis will collide with Earth on April 13, 2036. These reports conflict on the probability of such a doomsday event, but the question remains: How scared should we be? “Technically, they’re correct, there is a chance in 2036 [that Apophis will hit Earth]," said Donald Yeomans, head of NASA’s Near-Earth Object Program Office. However, that chance is just 1-in-250,000, Yeomans said. The Russian scientists are basing their predictions of a collision on the chance that the 900-foot-long (270 meters) Apophis will travel through what’s called a gravitational keyhole as it passes by Earth in 2029. The gravitational keyhole they mention is a precise region in space, only slightly larger than the asteroid itself, in which the effect of Earth's gravity is such that it could tweak Apophis' path. “The situation is that in 2029, April 13, [Apophis] flies very close to the Earth, within five Earth radii, so that will be quite an event, but we’ve already ruled out the possibility of it hitting at that time,” Yeomans told Life’s Little Mysteries. “On the other hand, if it goes through what we call a keyhole during that close Earth approach … then it will indeed be perturbed just right so that it will come back and smack Earth on April 13, 2036,” Yeomans said. The chances of the asteroid going through the keyhole, which is tiny compared to the asteroid, are “minuscule,” Yeomans added. The more likely scenario is this: Apophis will make a fairly close approach to Earth in late 2012 and early 2013, and will be extensively observed with ground-based optical telescopes and radar systems. If it seems to be heading on a destructive path, NASA will devise the scheme and machinery necessary to change the asteroid’s orbit, decreasing the probability of a collision in 2036 to zero, Yeomans said. There are several ways to change an asteroid’s orbit, the simplest of which is to run a spacecraft into the hurtling rock. This technology was used on July 4, 2005, when Deep Impact smashed into the comet Tempel 1.

**Asteroids impacts are over exaggerated- they are essentially nothing**

**Ron Cowen,** Science News Reporter, 9/13/20**10** [“Asteroid Close Calls Happen All the Time”, September 13th, 2010, http://news.discovery.com/space/asteroids-collisions-earth-near-misses.html]

The only thing that was particularly unusual about two asteroids that zipped past Earth September 8, astronomers say, was that anybody noticed them. Such close approaches -- one of the asteroids passed within 79,000 kilometers of Earth -- actually happen several times a week, according to scientists' calculations. Yet some media outlets described the close encounter as if it were a brush with Armageddon. "Quite frankly, I don't know why they're making such a fuss about it," says astronomer Brian Marsden of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass. "This is essentially nothing." Astronomers first spotted the two asteroids three days before their close encounter with Earth, using the Catalina Sky telescope near Tucson, Ariz., which routinely scans the skies for near-Earth objects. At the time they estimated the larger asteroid to be 10 to 20 meters (33 to 66 feet) in diameter, and the smaller 6 to 14 meters (20 to 46 feet) across. But subsequent observations by Richard Binzel and Francesca DeMeo of MIT using NASA's Infrared Telescope Facility on Hawaii's Mauna Kea showed that the objects were actually only about half that size. The discovery of the two space rocks demonstrates that programs like the Catalina survey, designed to find much larger near-Earth asteroids that do have the potential to cause devastating collisions, can also find smaller bodies, Marsden notes.

**1NC Heg Frontline**

The US will not be replaced as a super power for a very long time.

Brooks and Wohlforth 9(Stephen G., Associate Professor of Government at Dartmouth College, and William C., Professor of Government and Chair of the Department of Government at Dartmouth College, “Reshaping the World Order.”, Foreign Affairs; Mar/Apr2009, Vol. 88 Issue 2, p49-63, 15phttp://web.ebscohost.com/ehost/detail?vid=4&hid=13&sid=bd557b4f-58eb-4930-833b 9d20d6aab0f3%40sessionmgr15&bdata=JnNpdGU9ZWhvc3QtbGl2ZS

ZzY29wZT1zaXRl#db=aph&AN=36636314) OP

Only a few years ago, pundits were absorbed in debates about American "empire." Now, the conventional wisdom is that the world is rapidly approaching the end of the unipolar system with the United States as the sole superpower. A dispassionate look at the facts shows that this view understates U.S. power as much as recent talk of empire exaggerated it. That the United States weighs more on the traditional scales of world power than has any other state in modern history is as true now as it was when the commentator Charles Krauthammer proclaimed the advent of a "unipolar moment" in these pages nearly two decades ago. The United States continues to account for about half the world's defense spending and one-quarter of its economic output. Some of the reasons for bearishness concern public policy problems that can be fixed (expensive health care in the United States, for example), whereas many of the reasons for bullishness are more fundamental (such as the greater demographic challenges faced by the United States' potential rivals). So why has opinion shifted so quickly from visions of empire to gloomy declinism? One reason is that the United States' successes at the turn of the century led to irrational exuberance, thereby setting unreasonably high standards for measuring the superpower's performance. From 1999 to 2003, seemingly easy U. S. victories in Kosovo, Afghanistan, and Iraq led some to conclude that the United States could do what no great power in history had managed before: effortlessly defeat its adversaries. It was only a matter of time before such pie-in-the-sky benchmarks proved unattainable. Subsequent difficulties in Afghanistan and Iraq dashed illusions of omnipotence, but these upsets hardly displaced the United States as the world's leading state, and there is no reason to believe that the militaries of its putative rivals would have performed any better. The United States did not cease to be a superpower when its policies in Cuba and Vietnam failed in the 1960s; bipolarity lived on for three decades. Likewise, the United States remains the sole superpower today. Another key reason for the multipolar mania is "the rise of the rest." Impressed by the rapid economic growth of China and India, many write as if multipolarity has already returned. But such pronouncements mistake current trajectories for final outcomes--a common strategic error with deep psychological roots. The greatest concern in the Cold War, for example, came not from the Soviet Union's actually attaining parity with the United States but from the expectation that it would do so in the future. Veterans of that era recall how the launch of Sputnik in 1957 fed the perception that Soviet power was growing rapidly, leading some policymakers and analysts to start acting as if the Soviet Union were already as powerful as the United States. A state that is rising should not be confused with one that has risen, just as a state that is declining should not be written off as having already declined. China is generally seen as the country best positioned to emerge as a superpower challenger to the United States. Yet depending on how one measures GDP, China's economy is between 20 percent and 43 percent the size of the United States'. More dramatic is the difference in GDP per capita, for which all measures show China's as being less than 10 percent of the United States'. Absent a 1930s-style depression that spares potential U.S. rivals, the United States will not be replaced as the sole superpower for a very long time. Real multipolarity--an international system of three or more evenly matched powers--is nowhere on the horizon. Relative power between states shifts slowly. This tendency to conflate trends with outcomes is often driven by the examination in isolation of certain components of state power. If the habit during the Cold War was to focus on military power, the recent trend has been to single out economic output. No declinist tract is complete without a passage noting that although the United States may remain a military superpower, economic multipolarity is, or soon will be, the order of the day. Much as highlighting the Soviet Union's military power meant overlooking the country's economic and technological feet of clay, examining only economic output means putting on blinders. In 1991, Japan's economy was two-thirds the size of the United States', which, according to the current popular metric, would mean that with the Soviet Union's demise, the world shifted from bipolarity to, well, bipolarity. Such a partial assessment of power will produce no more accurate an analysis today.

**Us-China relations show growing stability**

**Wines 2011**(Michael, is the China bureau chief for The New York Times, Subtle Signs of Progress in U.S.-China Relations, <http://www.nytimes.com/2011/01/20/world/asia/20assess.html>)ED

After a 2010 notable mostly for Chinese acrimony toward the United States and its policies, Mr. Hu came to the White House not only saying that constructive relations between the two powers were essential, but also offering some modest concessions to demonstrate it. In a joint statement issued Wednesday, the Chinese for the first time expressed public concern over North Korea’s recent disclosure of a modern uranium-enrichment plant, a small but ardently sought step in American efforts to press Kim Jong-il to roll back his nuclear weapons program. More surprising, perhaps, Mr. Hu said at a White House news conference that “a lot still needs to be done in China in terms of human rights,” an unusual admission for a government that recently called the award of the Nobel Peace Prize to one of its dissidents a Western plot to embarrass Beijing.

**The Space Race is over- US and Russia cooperating on space.**

WSJ 10(Wall Street Journal, “Russia Seeks Cooperation With U.S. in Space Effort, 5-19-10, http://online.wsj.com/article/SB10001424052748704912004575252842393481092.html) OP

WASHINGTON—Russian leaders are trying to use the current thaw in relations with the U.S. to enhance cooperation in space, pushing for joint exploration efforts extending past the life of the international space station. Russian Deputy Prime Minister Sergei Ivanov spoke over the weekend with Charles Bolden, head of the National Aeronautics and Space Administration, and gave the Kremlin's strongest indication to date that it wants to team with the U.S. to explore more deeply into the solar system. View Full Image Reuters U.S. astronaut Tracy Caldwell Dyson and Russia's Mikhail Kornienko in March at a space center near Moscow. In a speech and brief interview Monday, Mr. Ivanov said the time is right for the two countries to share financial and engineering resources on possible ventures that would be launched past 2020 and travel beyond low-earth orbit. The two countries already collaborate extensively on the space station, an international consortium that includes Russia, the U.S. and several other countries. The station, which operates in low-earth orbit, is slated to continue for at least another decade.

**US and China relations are resilient**

**Harding ‘9** (Professor Harry, Professor in Department of Politics and Public Administration, The U.S. – China Relationship: From Fragility to Resilience <http://www.hku.hk/press/news_detail_5930.html>) ED

Back in the early 1990s, at the beginning of the Clinton Administration, it seemed appropriate to describe U.S. - China relations as a "fragile relationship".  But today, the relationship appears far more resilient, describing as containing a complex blend of competition and cooperation.  How can we understand these changes?  Why was the relationship relatively fragile then and more resilient today? What are the remaining unstable factors that could generate a crisis in the relationship, and how likely is such a crisis to occur? Professor Harry Harding, currently a Visiting Professor in the Department of Politics and Public Administration at the University of Hong Kong, one of the most prominent American scholars in the field of China studies and US-China relations, will give a public lecture on Sino-American relations. Professor Harding will discuss the development of Sino-America relationship.

**US heg sustainable.**

**Walt 10** (Stephen M., is the Robert and Renée Belfer Professor of International Affairs at Harvard University, “Five big questions”, 7-12-10, http://walt.foreignpolicy.com/posts/2010/07

/12/five\_big\_questions) OP

The United States will remain the world's most powerful state for some time to come. Its economy will be the world's largest until 2030 at least, and its per capita income will be much higher than that of other potential rivals (meaning there is great potential wealth that can be mobilized for national purposes). Unlike Europe, Japan, and Russia, the U.S. population will continue to grow and will not as old. And it will take a great deal of time before any other country amasses global military capabilities akin to ours.

Past Dominance makes Heg sustainable.

Stephen G. **Brooks**, Assistant Professor of Government at Dartmouth, and William C. Wohlforth, Associate Professor of Government at Dartmouth, 2008, World Out of Balance: International Relations and the Challenge of American Primacy, p. 38

The very same arguments apply in reverse to the hegemon. Consider, for example, high-technology military capabilities. An important feature of the current international security landscape is the absence of competition on this crucial dimension of power. The United States’ massive commitment to R&D in general and military-related R&D in particular presents ever higher barriers to entry into this competition. The trend since the collapse of the Soviet Union’s military industrial complex has been a steady widening of the U.S. lead.32 This dramatic advantage is not restricted to military weaponry; the United States is also in a class by itself in collecting, processing, and distributing information on the battlefield. To reverse the momentum in this state of affairs would require Herculean efforts

**1NC Economy Frontline**

All signs prove that the economy is back on track

May 7-26 By Doug May, Doug May, a Chartered Financial Analyst, founded May-Investments in Grand Junction in 2005. The Grand Junction-based Registered Investment Advisor provides custom wealth management for generations to come. Its mission is to be the premier wealth management firm in Western Colorado. May authored “Investment Heresies,” an online audio book available at www.InvestmentHeresies.com and publishes investment articles on www.GJretire.com. May-Investments was also one of the first advisors in the nation to provide a “managed money” option to employees within a qualified retirement plan using an actively managed exchange traded fund strategy. Article date: Jul 26 2011 <http://thebusinesstimes.com/despite-so-called-debt-crisis-u-s-economy-improving/> “Despite so-called debt crisis, U.S. economy improving”

Several people have asked me why the media circus du jour concerns about the U.S. debt crisis don’t seem to bother me as much as the Washington, D.C., policy wonks think it should. First, the market doesn’t seem to care much about the latest attempt at political grandstanding. If the market were worried about the U.S. defaulting on its Treasury debt, then the price of Treasury bonds would be falling and interest rates would be going up. Instead, we see bond yields flirting with all-time lows despite rising inflationary pressures. Recent bond auctions have been well-received — there appears to be no shortage of buyers. While the stock market swings day to day based on the latest headlines coming out of Washington, individual stocks are moving up based on strong earnings reports and continued merger and acquisition news. Cash-rich companies are buying earnings-rich competitors, driving prices higher in the process. Companies might be afraid to hire new employees, but they’re not afraid to purchase market share at current valuation levels. In addition, the May-Investments Leading Economic Index (LEI) keeps moving higher. Retail sales continue to grow, export activity is giving the manufacturing sector a boost, oil and natural drilling activity nationally remains quite strong and banks are finding a few new borrowers, having spent most of the last three years kicking half of their old borrowers out the door. The money supply is growing at a rate of 6 percent – a key indicator for a closet monetarist like myself. Finally, corporate profits are very strong. While profits in the banking sector are, in my opinion, illusory (banks aren’t replenishing loan loss reserves the way they ought to, which bloats earnings and bonuses at the expense of honesty and transparency), the profit rebound experienced by most large, publicly traded companies is nothing short of remarkable. With access to public debt markets, these companies don’t face the same capital shortage as local businesses. They’ve cut labor expenses, interest expenses and inventories. The rebound in profit margins and reported earnings is very real. As a result, the economy keeps growing. **The U.S. economy is a strong and powerful force**. It took an inordinate amount of stupidity for Wall Street’s sub-prime mortgage cabal to bring the economy to its knees. Then an arrogant government attacked the engine of prosperity, creating a wave of panic and then holding back the ensuing recovery. Soon, hopefully, the nightmare of endless deficits will be behind us and we will stop buying far more government than we need. It will still take awhile to pay off the debts incurred during the past decade of economic insanity, but at least the direction will reverse. As they say, when you’ve dug yourself into a deep hole and you don’t know how you’ll get out, first stop digging.

Economists believe the economy will continue to expand

Jobs 11’ Date: 07/07/2011 <http://www.job.com/career-advice/employment-news/survey-finds-improving-confidence-in-us-hiring-managers-.html> “Survey finds improving confidence in U.S. hiring managers”

A survey found U.S. hiring managers expect to hire during the second half of this year. A number of shocks to the global economy during the first half of 2011 resulted in a slower pace of economic growth. However, a growing number of economists project that the U.S. economy will continue to improve through the latter half of the year and along with it, the beleaguered labor market. According to a survey commissioned by CareerBuilder and conducted by Harris Interactive that surveyed 2,662 U.S. hiring managers between May 19 and June 8 of this year, many companies are confident that the economy will continue to expand during the last six months of this year as supply chain disruptions emanating from the Japanese crisis abate. Of those polled, more than 83 percent of U.S. hiring managers said that rising energy costs will not impact their hiring during the second half of this year. The price of a barrel of oil has jumped since the beginning of the year as the dollar slumped against a basket of six other currencies and amid economic and political instability throughout the Middle East and North Africa. On Thursday, oil futures for August delivery settled at $98 per barrel, which is significantly higher than year-ago levels. Despite rising energy prices, U.S. employers are confident that they will hire additional workers through the end of this year. More than 47 percent of poll respondents affirmed that they will increase their workforces between July and December. During the 2010 iteration of the mid-year survey, only 41 percent of respondents said they were planning to bring on additional employees. That, according to industry analysts, indicates that U.S. businesses are increasingly confident in the global economic recovery. What's more, compared to the 2010 survey, the number of businesses hiring specifically for full-time, permanent staff jumped seven percentage points to 35 percent. Companies that plan to hire contract or temporary employees also surged nine percent from 2010, with 12 percent of hiring managers indicating they planned to do so. On a more granular level, the study found that 23 percent of businesses intend to increase their customer service workforces, with 21 percent boosting their information technology workers and 20 percent planning to grow their sales divisions. "Last year, certain sectors or departments in companies were producing jobs," CareerBuilder chief executive Matt Ferguson said in a statement. "This year, the U.S. is seeing job creation in all industries, functions and company sizes. Our survey … and conversations we have with employers on a daily basis all indicate that hiring activity will sustain and improve in the months to come with a diverse mix of jobs."

There is no viable economic reason to go into space – privatization is better

Humans Future 11’ 7/14/2011 <http://www.humansfuture.org/space_colonization_economics.php.htm>

At the preseent time there is not a viable purely economic argument in favor of space exploration. With the cost of sending just one kilogram into orbit at around $10,000, access to space remains within the realm of governmental control. The cost of launching an object into space has not decreased since Apollo 11 went to the moon in 1969, and the cost of launching the space shuttle remains at a whopping $400 million a flight. This effectively allows governments (along with their associated bureaucracy and political chains) to control the space agenda, completely shutting out the private interests of capable, forward-thinking individuals and organizations. It is our opinion that the only way to make interstellar space travel a reality this century is through the introduction of competitive market forces to drive the cost of launch down to a fraction of current levels. This means, of course, the privatization of space.

NASA’s inaccurate cost estimates historically make space programs subject to underfunding and cost overruns

GAO ’05 (2/05, “NASA’s Space Vision: Business Case for Prometheus 1 Needed to Ensure Requirements Match Available Resources,” pg 10, 05-242)

Adding to these complexities, NASA has historically had difficulty establishing life-cycle cost estimates. In May 2004, we reported that NASA’s basic cost-estimating processes—an important tool for managing programs—lack the discipline needed to ensure that program estimates are reasonable.8 Specifically, we found that 10 NASA programs that we reviewed in detail did not meet all of our cost-estimating criteria—based on criteria developed by Carnegie Mellon University’s Software Engineering Institute. Moreover, none of the 10 programs fully met certain key criteria—including clearly defining the program’s life cycle to establish program commitment and manage program costs, as required by NASA. In addition, only three programs provided a breakdown of the work to be performed. Without this knowledge, we reported that the programs’ estimated costs may be understated and thereby subject to underfunding and cost overruns, putting programs at risk of being reduced in scope or requiring additional funding to meet their objectives. In this report we recommended that NASA take a number of actions to improve its cost - estimating practices. NASA concurred noting that our recommendations validated and reinforced the importance of activities underway at NASA.

Space launch costs are high and rising

Spaceflight Now ’11 (“Rising launch costs could curtail NASA science missions,” 4/4/11, pg online @ http://spaceflightnow.com/news/n1104/04launchcosts/)

A previous NLS contract expired last year and held provisions for heavily discounted rocket costs due to projections of a more robust U.S. commercial launch services market when it was signed in 2000. "The expectation at that time was there was a large commercial market," Cline said. "That did not materialize. As opposed to government being a secondary customer buying on the margin, government became the primary customer." With government as the anchor customer, marginal launch costs for NASA and the Air Force are on the rise. "Rocket costs are going crazy and mostly up," said Steve Squyres, a respected planetary scientist and chair of a panel of researchers that issued recommendations in March for NASA to address the possibility of a declining budget matched against rising launch prices. Squyres led the National Research Council's planetary science decadal survey, an independent report ranking a slate of robotic solar system missions for the next 10 years. "Launch vehicle costs are high," Squyres said. "They're growing. They're growing in a somewhat volatile and unpreditable fashion. They're becoming an increasingly large fraction of the cost of planetary missions, which is a trend we view with some alarm."

1NC Energy Frontline

LSP requires a lot more study to be viable

Rapp 07’ Donald Rapp Independent Contractor drdrapp@earthlink.net February 18, 2007 “Assessment of Concepts for Utilizing Lunar Resources (1) Solar Power from Space or the Moon (2) 3He from the Moon for Fusion on Earth (3) Utilization of Lunar Resources for Space Missions”

Based on what we know at this point, the SPS in GEO concept does not appear to be affordable or practical. That does not necessarily mean that further study is not useful, but it does cast a shadow of doubt on the concept. Beaming power from the Moon has the huge potential advantage that the solar arrays could possibly be fabricated on the Moon from indigenous resources. Nevertheless, lunar solar power concepts suffer from many of the difficulties associated with SPS in GEO. Furthermore, lunar solar power has not received the attention, analysis and evaluation given to SPS in GEO. The fact is that lunar solar power requires a great deal more study. But elimination of the need to lift solar arrays from Earth appears to be an important tipping point in favor of the lunar approach, and based on the very incomplete analyses available today, it appears likely that the only form of beamed power that has even a small chance of becoming practical half a century from now is lunar solar power. Unfortunately, NASA does not seem to have a strategy for pursuing and evaluating these proposed schemes, and lunar solar power has been denigrated to one entry in a table of things NASA could conceivably do on the Moon. NASA is expending a considerable amount of funding on lunar ISRU for oxygen production, which has a rather meager payoff, requires a significant investment, and has low mission impact. These funds could be better directed into processes for production of solar cells, perhaps using the fluorine process advocated by Landis.

**Lunar solar power costs too much and is still in the research phase**

ABC News 11’ Published by ABC News Tuesday, July 12th, 2011 http://www.eco-business.com/news/is-luna-ring-the-energy-solution-or-looney-pipe-dream/ “Is ‘Luna Ring’ the energy solution or looney pipe dream?”

Earlier this year, the Japan Aerospace Exploration Agency, Mitsubishi Electric Corp, and Kyoto University announced they would jointly conduct solar power generation research. The hope is to launch a trial satellite system that generates solar power in the next decade. Separately, Mitsubishi Electric has proposed the Solarbird project, which would use dozens of solar power generating satellites to produce the amount of energy equal to a nuclear power plant. Masanori Komori with the Institute of Energy Economics says solar energy generated in outer space sounds good in theory, but costs too much. He says Japan should be looking at more realistic forms of alternative energy, like geothermal power. “The problem with lunar solar energy is that it’s still in the research phase,” Komori said. “We need to first focus on what we can get now.” Yoshida admits he doesn’t have a concrete estimate on the cost of the Luna Ring, or an exact time frame on how long construction would take. But he has no doubts about its potential for alternative energy. “All we are doing is using existing resources. We have sunlight, we have solar panels, and we already have microwaves and laser beams,” Yoshida said. “If we can continue to do the research, we think there’s a huge chance this could become reality.”

### Helium-3 won’t be useful for decades – no fusion facilities or funding

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

However, planetary scientist Taylor said the reactor technology for converting helium 3 to energy was still in its infancy and could take years to develop. "The problem is that there is not yet an efficient type of reactor to process helium 3. It is currently being done mostly as a laboratory experiment. Right now at the rate which it (research) is proceeding it will take another 30 years," he said. Other scientists said the reactor would be safe in terms of radioactive elements and could be built right in the heart of any city. "Potentially there are large reserviours of helium 3 on the moon, said D.J. Lawrence, planetary scientist at the US Los Alamos National Laboratory. "Just doing reconnaissance where the minerals are and to find out where helium 3 likes to hang out is the first step, so when the reactor technology gets to work we are ready and have precise information," Lawrence said. "It really could be used as a future fuel and is safe. It is not all science fiction." "There are visionaries out there and now the question arises where the funds come from. If people get on board to do it there is no doubt it could be done," he said. Taylor echoed Lawrence's views adding that there were no funds available for funding non-petroleum energy projects in the United States.

### We don’t have any fusion reactor suitable for He3 – building one is decades away

Wylie 04 [Margie - National Correspondent for Science and Technology, The Grand Rapids Press, Feb 1, 2004 “Moon has no fast answer to energy needs: In theory, moon rocks could be a cheap source of electricity. In practice, the technology is decades away,” http://margiewylie.com/media/moon.pdf]

Most of today's fusion research uses the hydrogen isotopes deuterium and tritium, which fuse at relatively low temperatures, about 100 million degrees, Wurden said. But deuterium and tritium mixtures release about 80 percent of their energy in the form of fast neutrons, which produce radioactive waste. A helium-3 and deuterium mix gives off much fewer fast neutrons, but requires about four times the temperature to react. A pure helium-3 reaction, on the other hand, would produce zero radioactive waste at the cost of even higher temperatures. And heat's not the only problem. Helium-3 atoms are about 10 times harder to fuse together than tritium and deuterium and so require more advanced containment systems than we know how to build today, said Wurden, who is the Los Alamos program manager for the U.S. Department of Energy's Office of Fusion Energy Sciences. "Nobody questions that helium-3 is a great fuel," Wurden said. "The problems are it's on the moon and we haven't even built a reactor good enough for a simple deuterium-tritium fuel mix." Even if the physics weren't so difficult, mining helium-3 would present challenges. While the isotope is relatively abundant on the moon, it still occurs at only 50 parts per million, said Alan Binder, director of the Lunar Research Institute in Tucson, Ariz., which advocates commercializing the moon's resources. That means shoveling 20,000 metric tons of regolith into 700-degree ovens to boil off one metric ton of the precious isotope, which must be sorted out from regular helium and other naturally occurring elements, like hydrogen and oxygen. Of course, there's also the expense of transporting it back to Earth. But Binder doesn't expect miners to fly to the moon for the express purpose of bringing back the isotope. Instead, he said, helium-3 would be harvested as a byproduct of building and maintaining a lunar settlement. Schmitt predicted the gas could be returned to Earth for under $1 billion a metric ton. Kulcinski adds that, if it sold for $4 billion a metric ton, helium-3 would still be a good energy value: "That's the equivalent of paying $28 a barrel for oil." Last year, crude oil prices averaged $26.60 per barrel, based on figures from the U.S. Department of Energy. Fortunately, there is time to sort the issues out.

It would take 50 years for Helium-3 infastructure to be developed—not feasible

Williams 7 (Mark, MIT Tech Review, “Mining The Moon” http://www.technologyreview.com/printer\_friendly\_article.aspx?id=19296 8/23 JF)

Could He3 from the moon truly be a feasible solution to our power needs on Earth? Practical nuclear fusion is nowadays projected to be five decades off--the same prediction that was made at the 1958 Atoms for Peace conference in Brussels. If fusion power's arrival date has remained constantly 50 years away since 1958, why would helium-3 suddenly make fusion power more feasible? Still, Kulcinski's reactor proves only the theoretical feasibility and advantages of He3-He3 fusion, with commercial viability lying decades in the future. "Currently," he says, "the Department of Energy will tell us, 'We'll make fusion work. But you're never going to go back to the moon, and that's the only way you'll get massive amounts of helium-3. So forget it.' Meanwhile, the NASA folks tell us, 'We can get the helium-3. But you'll never get fusion to work.' So DOE doesn't think NASA can do its job, NASA doesn't think that DOE can do its job, and we're in between trying to get the two to work together." Right now, Kulcinski's funding comes from two wealthy individuals who are, he says, only interested in the research and without expectation of financial profit. Overall, then, helium-3 is not the low-hanging fruit among potential fuels to create practical fusion power, and it's one that we will have to reach the moon to pluck. That said, if pure He3-based fusion power is realizable, it would have immense advantages.

Practical use of Helium-3 is decades away—too much doubt

AP 4 (Associated Press, “What the moon has to offer” http://www.msnbc.msn.com/id/3967790/ns/technology\_and\_science-space/t/what-moon-has-offer/ 1/15 JF)

There’s so little helium-3 on Earth that the technology hasn’t been studied much, but the moon appears to have it in abundance, he said. That’s because the moon lacks the atmosphere and magnetic field that keep helium-3 from raining down on our planet from outer space. The downside is that scientists haven't yet figured out how to build a safe, energy-producing fusion reactor. The ITER project, which draws its acronym from the old title "International Thermonuclear Experimental Reactor," is aimed at conducting fusion research, but scientists say commercial applications are decades away. Even then, it's not clear whether helium-3, mined on the moon and shipped back to Earth, will be the least expensive option for fueling such reactors.

He3 mining is too expensive to be feasible

Morrow ’11 (John A, worked in the Army Defense Appellate Division in Virginia, <http://www.quora.com/Just-how-feasible-is-to-mine-Helium-3-on-the-Moon> “Just how feasible is to mine Helium-3 on the Moon?”) ED

Economically feasible? Absolutely not. The cost of constructing and maintaining a moon base, plus the astronomical (pun intended) cost of actually transporting materials to and from the moon would render it utterly pointless. Current costs (depends on who you ask) are something like $5000-$10,000 per pound to put something into low earth orbit - nowhere near the moon. Efforts are underway to lower that (some cool stuff being done in the private sector) but there is no conceivable way that you could do this economically anytime in the next several decades.

**Abundant solar energy is available on earth**

**Bearden ‘9** (<http://www.altenergy.org/renewables/solar.html> Thomas Lieutenant Colonel U.S. Army (Retired). President and Chief Executive Officer, CTEC, Inc. MS Nuclear Engineering, Georgia Institute of Technology) ED

The Earth receives an incredible supply of solar energy. The sun, an average star, is a fusion reactor that has been burning over 4 billion years. It provides enough energy in one minute to supply the world's energy needs for one year. In one day, it provides more energy than our current population would consume in 27 years. In fact, "The amount of solar radiation striking the earth over a three-day period is equivalent to the energy stored in all fossil energy sources."    Solar energy is a free, inexhaustible resource, yet harnessing it is a relatively new idea. The ability to use solar power for heat was the first discovery. A Swiss scientist, Horace de Saussure, built the first thermal solar collector in 1767, which was later used to heat water and cook food. The first commercial patent for a solar water heater went to Clarence Kemp of the US in 1891. This system was bought by two California executives and installed in one-third of the homes in Pasadena by 1897. Producing electricity from solar energy was the second discovery. In 1839 a French physicist named Edmund Becquerel realized that the sun's energy could produce a "photovoltaic effect" (photo = light, voltaic = electrical potential). In the 1880s, selenium photovoltaic (PV) cells were developed that could convert light into electricity with 1-2% efficiency ("the efficiency of a solar cell is the percentage of available sunlight converted by the photovoltaic cell into electricity"), but how the conversion happened was not understood. Photovoltaic power therefore "remained a curiosity for many years, since it was very inefficient at turning sunlight into electricity." It was not until Albert Einstein proposed an explanation for the "photoelectric effect" in the early 1900s, for which he won a Nobel Prize, that people began to understand the related photovoltaic effect.

**We should implement easy, feasible, low cost clean energy plans, rather than the high cost of mining He3**

**Bearden ‘9** (<http://www.altenergy.org/renewables/solar.html> Thomas Lieutenant Colonel U.S. Army (Retired). President and Chief Executive Officer, CTEC, Inc. MS Nuclear Engineering, Georgia Institute of Technology) ED

There are several advantages of photovoltaic solar power that make it "one of the most promising renewable energy sources in the world." It is non-polluting, has no moving parts that could break down, requires little maintenance and no supervision, and has a life of 20-30 years with low running costs. It is especially unique because no large-scale installation is required. Remote areas can easily produce their own supply of electricity by constructing as small or as large of a system as needed. Solar power generators are simply distributed to homes, schools, or businesses, where their assembly requires no extra development or land area and their function is safe and quiet. As communities grow, more solar energy capacity can be added, "thereby allowing power generation to keep in step with growing needs without having to overbuild generation capacity as is often the case with conventional large scale power systems." Compare those characteristics to those of coal, oil, gas, or nuclear power, and the choice is easy. Solar energy technologies offer a clean, renewable and domestic energy source.

1NC Solvency Frontline

Space is unsustainable for humans – only earth can sustain life

Trevors, J. (Trevors: University of Guelph and Adjunct Professor, a 28 year record of microbiology research, graduate and undergraduate teaching, consulting and editing/editorships has been achieved) **’**09 *#* Springer Science + Business Media B.V. 2009

“The Earth Is the Best Place to Live” – http://www.springerlink.com/content/p68867688844p083/fulltext.pdf

The Earth is still the best planet to live despite our current problems/challenges of human population growth, total global pollution, global climate change, pandemics, wars, hunger and intolerance, to name a few examples. The universe has to be billions of years old to have sufficient time to produce the elements required for living organisms and their evolution. One would think that all humans would therefore take better care of the only known outpost of life in the universe. The Earth is the correct distance from our sun to maintain water in its liquid state (and gaseous and solid states) necessary for living organisms. Water has a low viscosity, high melting point, high boiling point and can act as a hydrogen donor and acceptor. Water can buffer against shifts in temperature. Water floats when it freezes and becomes ice, and reaches its maximum density at 4°C not at 0°C. These characteristics have immense importance for aquatic life. The size and mass of the Earth are correct for life. A small planet does not have sufficient gravity to hold an atmosphere such as ours. If the Earth was larger, the atmosphere would be denser and restrict light necessary for photosynthesis. No photosynthesis means no life as we know it on the Earth. The Earth is as good as it gets for the continued survival of all species, if humans simply reduce human population growth and the total pollution of the planet. This will require international cooperation and the efforts of all people, especially in the affluent developed countries that over pollute and over consume. The affluent countries must also provide the resources to assist less affluent countries with their basic human needs and rights. This is all doable if humans simply redirect efforts from conflicts and wars to international cooperation.

Earth is ONLY outpost, thus we can solve challenges through population control, international cooperation, and pollution reduction

Trevors, J. (Trevors: University of Guelph and Adjunct Professor, a 28 year record of microbiology research, graduate and undergraduate teaching, consulting and editing/editorships has been achieved) ’09 # Springer Science + Business Media B.V. 2009

“The Earth Is the Best Place to Live” – http://www.springerlink.com/content/p68867688844p083/fulltext.pdf

The already overpopulated Earth with several billion toomany people, consuming and polluting and entangled in complex conflicts for limited resources has no rationale present and future within the current paradigm. There is no future in conflicts, wars, violations of basic human rights and needs, competition, discrimination, lack of public infrastructure, hunger and poverty all entangled within pollution and global climate change. The challenges/ problems that we currently face can quickly turn into global crises (e.g. global warming, pandemics, overpopulation, food shortages) if the correct international actions are not implemented. The Earth is our only outpost. We can not travel quickly to other planetary locations and sustain life as we know it. Our correct choices are conservation, environmental protection, planned and managed human population control, international cooperation, evolve modern democracies and stable governments, education, basic human rights and needs and too all strive for the sanctity of life and humanity. The best way to halt total global pollution and climate change is to reduce total global pollution and the factors that cause climate change and overpopulation. What a wonderful world it will be.

Missions to the moon tradeoff with key climate monitoring missions

LA Times 06’ December 10, 2006, <http://articles.latimes.com/2006/dec/10/opinion/ed-moon10> “Been there, done that: A manned moon mission doesn't make sense. Robots are better -- just look at their success on Mars.”

WHEN IT COMES TO poetic vision, "Fly Me to the Moon" has it all over "Global Precipitation Mission." But the prosaic and twice-delayed NASA meteorology project would conduct a useful scientific study of Earth weather. A return to the moon is a romantic but expensive mission in search of a purpose. NASA's announcement last week that it would erect a permanent moon station by 2020 as a sort of scientific way station to Mars was dramatic but not unexpected -- especially not after President Bush gave a speech two years ago calling on the space agency to return astronauts to the moon and from there to Mars. NASA officials enthused about the international partners for the moon project and the savings they would achieve by using existing technologies. What they didn't say is how much it would cost -- and more important, why do it in the first place except to recapture a wrinkled sense of glory. Ads by Google Discover Distant PlanetsThe New Charles Hayden Planetarium At The Museum of Science. Buy Tix! www.mos.org Even NASA's "Why the Moon?" website doesn't really explain it. It's full of oddly cheerful videos ("We're going back to the moon ... this time to stay!") suggesting that people might like to colonize the moon as a new home (not until the surf's up at the Sea of Tranquillity) and vowing that this will enable new scientific studies, encourage global cooperation and inspire children. These are laudable goals, all of which could be managed without a manned moon station and a 12-figure price tag. The U.S. and India already are working together on an unmanned space mission. Manned moon flight may appeal to baby boomers, but it makes little scientific sense for most space missions these days. Robots can now perform, or be developed to perform, most of the tasks people would do at a moon station. And even if the world shares the goal of landing astronauts on Mars, this is a roundabout way to achieve it. Why re-create the old technologies for going to the moon when they are of no use to get to Mars? For too long, NASA has been overspending on manned flight and under-funding scientific study. Vital missions to study the Earth's climate, for example, have been delayed for years or indefinitely. An unmanned scientific mission to scan for Earth-like planets in nearby solar systems, scheduled to launch in 2011, has been postponed until 2015. Frank Sinatra recorded the song "Fly Me to the Moon" in 1964, five years before Neil Armstrong got there. These days, it makes more sense to have robots do the flying. Just last week, scientists announced they'd found evidence of water flowing on Mars -- a possible harbinger of Martian life. The discoverer of this exciting news? The unmanned Mars Global Surveyor.

**Environmental satellites are key to track and prevent Natural Disasters and Global Warming**

WEST ’06(Larry; “Budget Cuts and Mismanagement Place Environmental Satellites at Risk,” http://environment.about.com/b/2006/03/06/budget-cuts-and-mismanagement-place-environmental-satellites-at-risk.htm, 3/5, SO)

Budget cuts and cost overruns are threatening the current integrity and future existence of a network of U.S. environmental satellites that help scientists forecast hurricanes, droughts and floods, and predict global warming, according to a news story by the Associated Press. "The system of environmental satellites is at risk of collapse," said Richard A. Anthes, president of the University Corporation for Atmospheric Research and chairman of a National Academy of Sciences committee that advises the federal government on developing and operating environmental satellites, in an interview with the Associated Press. "Every year that goes by without the system being addressed is a problem." Satellites Give Warning Before Disasters Strike Scientists say that neglecting the environmental satellites orbiting the Earth could have severe human consequences. If the environmental satellites aren’t there to provide up-to-date information about approaching natural disasters and threats from other severe climate and weather conditions, then scientists will be unable to warn the people most likely to be harmed and the public safety officials who must try to protect them. Yet, at a time when the United States is still recovering from the worst hurricane season on record, when Africa and South America are experiencing devastating droughts, and when regions worldwide are feeling the first effects of global warming, NASA is managing its budget as though extreme weather and natural disasters were passé. In an effort to save money, NASA has canceled plans for at least three earth-observing satellites, and cost overruns have delayed a new generation of weather satellites until 2010 or 2012. The Government Accounting Office has called the entire U.S. environmental satellite effort “a program in crisis.” Balancing Budgets and Priorities NASA Administrator Michael Griffin has the difficult job of trying to stretch his shrinking budget to cover the cost of operating the space shuttle and the space station as well as space exploration and programs such as the environmental satellites. NASA’s proposed budget for 2007 includes $6.2 billion for space shuttle and space station operations, and $4 billion for planning future missions to the moon and Mars, but only $2.2 billion for satellites that help scientists observe the Earth and the sun. "We simply cannot afford all of the missions that our scientific constituencies would like us to sponsor," Griffin told members of Congress when he testified before the House Science Committee on Feb. 16, 2006. Perhaps not, but it seems as though humanity’s critical need for the information that environmental satellites provide should place them higher on NASA’s list of priorities.

Natural disasters will cause extinction.

SID AHMED ‘05 (Mohamed, Managing Editor for Al-Ahali, “The post-earthquake world”, Issue #724, <http://weekly.ahram.org.eg/2005/724/op3.htm>)

The human species has never been exposed to a natural upheaval of this magnitude within living memory. What happened in South Asia is the ecological equivalent of 9/11. Ecological problems like global warming and climatic disturbances in general threaten to make our natural habitat unfit for human life. The extinction of the species has become a very real possibility,whether by our own hand or as a result of natural disasters of a much greater magnitude than the Indian Ocean earthquake and the killer waves it spawned. Human civilisation has developed in the hope that Man will be able to reach welfare and prosperity on earth for everybody. But now things seem to be moving in the opposite direction, exposing planet Earth to the end of its role as a nurturing place for human life. Today, human conflicts have become less of a threat than the confrontation between Man and Nature. At least they are less likely to bring about the end of the human species. The reactions of Nature as a result of its exposure to the onslaughts of human societies have become more important in determining the fate of the human species than any harm it can inflict on itself. Until recently, the threat Nature represented was perceived as likely to arise only in the long run, related for instance to how global warming would affect life on our planet. Such a threat could take decades, even centuries, to reach a critical level. This perception has changed following the devastating earthquake and tsunamis that hit the coastal regions of South Asia and, less violently, of East Africa, on 26 December. This cataclysmic event has underscored the vulnerability of our world before the wrath of Nature and shaken the sanguine belief that the end of the world is a long way away. Gone are the days when we could comfort ourselves with the notion that the extinction of the human race will not occur before a long-term future that will only materialise after millions of years and not affect us directly in any way. We are now forced to live with the possibility of an imminent demise of humankind.

Colonization isn’t sustainable – health reasons

Phil for Humanity [no date] by Phil B. <http://www.philforhumanity.com/Colony_on_the_Moon.html> “Why the Moon will Never be Colonized”

The Moon will never be colonized for a single reason. Basically, the Moon’s gravity is less than 17% of Earth’s gravity, and people can not survive long periods of time at such low gravity. Even though people could easily survive short time periods in this low gravity, it would be extremely unhealthy for prolonged periods of time especially when returning to Earth. For instance, long stays in low gravity can and will result with significant loss in bone density and muscle atrophy, just to name the two most common issues with low gravity. However, assuming that the colonization of the Moon is a one-way ticket without ever returning back to Earth and Earth’s higher gravity, adults could live relatively long and mostly healthy lives on the Moon. The bigger problem with colonizing the Moon is the effects that low gravity will have on children. The human development process has evolved perfectly with Earth’s high gravity. On the Moon, children would most likely develop severe and possibly fatal deformities under low gravity. For instance, their bones would be extremely brittle and break often. Their hearts would be very weak and never fully develop, as well as possibly all of their other muscles too. Children would literally grow to extreme heights that will cause severe complications on the spinal cord and digestive systems, because these organs have limited stretching capabilities. As a result, colonists on the Moon might not be able to have healthy children capable of living long enough to have children of their own. In my opinion, a colony with little or no possibility of children has no future and is not really a colony. Furthermore in my opinion, no one would even try to start a colony on the Moon knowing the health risks of themselves and their children. As a result, I firmly believe there will never be a colony on the Moon. Of course, mankind can and will use the Moon for several other purposes, such as mining, factories, recreation, military, science and research just to name a few ideas. However, long term colonization on the Moon is not wise. I would even imagine that governments and businesses would ban long stays on the Moon for all pregnant women and children just as a precaution. The only exception that I can think of is if scientists can one day create artificial gravity on the Moon. Unfortunately, this only exists in science fiction right now, so I believe there will never be a colony on the Moon.

**Spending Links**

Lunar Colonization would be incredibly expensive

Easterbrook 06’ By Gregg Easterbrook Posted Friday, Dec. 8, 2006, at 1:52 PM ET <http://www.slate.com/id/2155164/> “Moon Baseless, NASA can't explain why we need a lunar colony.”

The United States will have a permanent base on the moon by the year 2024, NASA officials said on Monday. What does the space agency hope to discover on the moon? The reason it built the base. Coming under a presidency whose slogan might be "No Price Too High To Accomplish Nothing," the idea of a permanent, crewed moon base nevertheless takes the cake for preposterousness. Although, of course, the base could yield a great discovery, its scientific value is likely to be small while its price is extremely high. Worse, moon-base nonsense may for decades divert NASA resources from the agency's legitimate missions, draining funding from real needs in order to construct human history's silliest white elephant. Related in Slate Seth Stevenson recounted the history of the Russian space program. Brendan I. Koerner explained why scientists want to develop vaccines in space. Daniel Engber went over the definition of a launch window, and described what a space tourist does all day. What's it for? Good luck answering that question. There is scientific research to be done on the moon, but this could be accomplished by automatic probes or occasional astronaut visits at a minute fraction of the cost of a permanent, crewed facility. Astronauts at a moon base will spend almost all their time keeping themselves alive and monitoring automated equipment, the latter task doable from an office building in Houston. In deadpan style, the New York Times story on the NASA announcement declared, "The lunar base is part of a larger effort to develop an international exploration strategy, one that explains why and how humans are returning to the moon and what they plan to do when they get there." Oh–so we'll build the moon base first, and then try to figure out why we built it. Advertisement NASA itself can't really offer an answer, though it does offer a free, downloadable "Why the Moon?" poster. According to the poster, a moon base would "enable eventual settlement" of Earth's satellite—which might happen someday, but represents an absurd waste of tax money in the current generation. (No one has any interest in settling Antarctica, which is much more amenable to life than the moon and can be reached at far less than 1 percent of the cost.) NASA also says there might be commercial opportunities on the moon. Ha! The agency justified the space station partly with the claim that commercial enterprises would pay hefty fees to use the it for microgravity manufacturing; instead, there's been no revenue-generating activity on the space station, other than a golf ball commercial and the space-tourist fees paid to the Russian space agency. If businesses have no profit use for low-Earth orbit, how would they make money on the moon, with at least double the launch expense? Hilariously, NASA says another purpose of the moon base would be to "create international lunar heritage sites." We'll preserve that dust for future generations! And the moon base would be the risk to the "lunar heritage" in the first place. So, what is it for? Transparently, the true goal of the moon base would be to keep budget lines and contracts flowing to the congressional districts and aerospace contractors wired in to current NASA spending. Don't we need a moon base to go to Mars? No! When George W. Bush made his Mars-trip speech almost three years ago, he said a moon base should be built to support such a mission. This is gibberish. All concept studies of Mars flight involve an expedition departing from low-Earth orbit and traveling directly to the red planet. Stopping at the moon would require fuel to descend to the lunar surface, then blast off again, which would make any Mars mission hugely more expensive. The launch cost of fuel—that is, the cost of placing fuel into orbit—is the No. 1 expense for any manned flight beyond Earth. The Lunar Excursion Module, the part of the Apollo spacecraft that touched down, was two-thirds fuel—all exhausted landing and taking off again from the moon. Rocket technology hasn't changed substantially since the 1960s, so a large portion of the weight of any Earth-to-Moon-to-Mars expedition would be dedicated to the fuel needed for just the layover. This makes absolutely no sense, and the fact that administration officials get away with telling gullible journalists that a Mars mission would use a moon base shows how science illiteracy dominates the big media. (It is imaginable that a moon facility could support Mars exploration by refining supplies from the lunar surface and then using automated vessels to send the supplies to the red planet, or to rendezvous with an expedition en route. But that's pretty speculative, and at any rate, the cost of building a moon base would far exceed that of simply launching the supplies from Earth.) How much will it cost? NASA said Monday it can build a moon base for about the $10 billion per year it now spends on the (soon-to-be-retired) space shuttle and the space station. (The agency also says that the international community will soon begin funding the space station, but no nation has agreed to this.) Considering that the space station and shuttle cost about $10 billion per year, a moon base might cost much more. The space station is 200 miles away and only goes up, never comes down. The equipment for a moon base would need to be accelerated to a significantly higher speed than was required for the space station, and that means a lot more fuel and a lot more expense. Moon-base ships will also need lots of fuel to descend to the lunar surface, and some will need still more fuel to blast off again. Remember, launching the fuel is a major expense. The Apollo program spent about $135 billion, in 2006 dollars, to place about 50 usable tons on the lunar surface. Even an austere moon base would need 300 or 400 tons of structure, equipment, fuel, vehicles, and life support—and probably more. Suppose today's technology allows for lunar-rated materiel to be built and placed on the moon at half the cost of the Apollo project. This quickly gets you to a program cost of at least $300 billion to build the moon base. What should NASA do? As I argued in Slate back in March, rational budget priorities for the agency would include first and foremost an exhaustive study of the sun, as well as the Earth and Mars and Venus, the two other Earthlike planets in the solar system, with automated probes and satellites. Second, it borders on criminal that NASA is doing nothing to prepare for a deadly comet or asteroid strike. (The agency says it has already cataloged 835 "potentially hazardous" large space rocks.) Third, space telescopes should continue to be used to study the distant universe. Fourth, researchers should be working on a breakthrough in propulsion technology, which could make getting to the moon more affordable. For 20 years now, NASA has gone through one iteration after another of supposed "dramatic" self-reevaluations, and always come to the same conclusion: All existing spending programs having to do with the astronaut corps are sacrosanct, regardless of whether they serve any purpose. With public-good space needs unmet and the enunciation of a moon-base plan that will waste colossal sums of public money, agency director Michael Griffin has simply raised NASA's middle finger to the taxpayer.

The plan would cost an egregious amount of money

Baum 07’ Rudy M. Baum, Editor-in-chief (B.A. in chemistry, Duke University, 1975; studied medicine at Georgetown University Medical School, 1976.), February 5, 2007, Volume 85, Number 6 p. 3

<http://pubs.acs.org/cen/editor/85/8506editor.html> “NASA's Bad Idea”

In this week's issue of C&EN, Associate Editor Susan Morrissey focuses on the mission President George W. Bush has set for NASA—returning humans to the moon by 2020 to establish a permanent base that would be a stepping stone for a manned mission to Mars (see page 23). Universal Press Morrissey is a fine reporter and she does an excellent job of laying out the Administration's rationale for the mission. Her story explores the pros and cons of this new direction for the U.S. space program and lays out some of NASA's ideas on establishing a moon base. Unfortunately, what no amount of balanced reporting can disguise is that such a mission to the moon is an egregiously bad idea. As Morrissey's sources make clear, it will cost a staggering amount of money (an amount that NASA, so far, has not bothered to calculate), deprive NASA's legitimate scientific missions of funding, and accomplish exactly what the International Space Station has accomplished, which is nothing. "Nobody is clear on what science the astronauts are going to do on the moon," Robert L. Park, a physics professor at the University of Maryland, told Morrissey. "To invent the project and then look for the science to justify it is not the way it should be done." There is important science to be done in space. Observing our home planet, for example, is one such activity. Unfortunately, neglect of an aging fleet of Earth-orbiting satellites is leading to a significant degradation of our ability to measure changes in Earth's climate. Diverting NASA's attention and resources to establishing a moon base will only exacerbate this problem. In introducing the idea of establishing a base on the moon, President Bush used the inspirational language of exploration and discovery. "The extended human presence on the moon will enable astronauts to develop new technologies and harness the moon's abundant resources to allow manned exploration of more challenging environments," the President said. "The experience and knowledge gained on the moon will serve as a foundation for human missions beyond the moon, beginning with Mars." The idea that humans have to visit a place and leave footprints there for humanity to claim to have explored it is romantic rubbish that NASA's own robotic missions have thoroughly discredited. Over the past three decades, these missions have expanded human understanding of the solar system immeasurably. The Voyager, Galileo, and Cassini missions to the outer solar system have utterly transformed our view of Jupiter, Saturn, Uranus, and Neptune. The Opportunity and Spirit rovers on Mars have performed beyond their designers' wildest dreams and extended human eyes, hands, and brains to explore the surface of Mars at a level of detail that is unprecedented. There is an enormous cost to designing and building spacecraft that can transport humans safely to the moon and beyond. Space will never be anything other than a brutally hostile environment. The surface of the moon is outer space with gravity. The surface of Mars is far harsher than Antarctica in the dead of the austral winter. Putting humans in these environments serves no useful purpose whatsoever other than satisfying an atavistic hubris that is no longer affordable.

A mission to the Moon would be too expensive to be useful

O’Neill 08’ by Ian O'Neill on August 1, 2008 “John Glenn Speaks Out Against Future Moon Base”

NASA’s first man to orbit the Earth, John Glenn has said a plan to set up a Moon base to facilitate the manned exploration of interplanetary space is a very bad idea. Under the current US government direction, NASA hopes to (eventually) establish the manned outpost for future launches to Mars and beyond, thus avoiding the huge gravity well of the Earth. But Glenn has cited the plan as “questionable,” pointing out that to pack the huge amount of equipment on board the future Ares V rocket will be “enormously expensive.” So what’s the alternative? Build a vehicle in Earth orbit and accelerate it to the Red Planet… Legendary astronaut and former senator John Glenn isn’t one to keep his opinions to himself, especially when the future of the US space agency is on the line. Back in May, Glenn sent a strong message to Washington: Extend the life of the Shuttle and re-commit to long-term investment in the International Space Station (after all, extending the Shuttle’s lifetime is a bit better than some of the alternatives). His warnings come at a time when there is increased concern about NASA’s “five- year gap” in its ability to ferry astronauts into space from Shuttle decommissioning in 2010 and first scheduled Orion module/Ares rocket launch in 2015. Glenn is not the only ex-astronaut speaking out about NASA’s future. Buzz Aldrin, second man on the Moon and Apollo 11 lunar module pilot, also came forward in June with his worries that NASA will be overtaken by the space efforts of the international community. So why is John Glenn against the establishment of a lunar base? He was addressing US President George Bush’s vision to set up a Moon base so it can be prepared as a launch pad to further explore space. “It seems to me the moon is questionable as a way station [to Mars],” Glenn said when addressing a congressional committee on July 30th. The hearing was held for a House Science and Technology Committee, in light of NASA’s 50 years of operation and future direction of the agency. “If that’s what we’re doing – which I don’t believe it is – but if that’s what we’re thinking about doing, that is enormously expensive,” he continued. From a financial standpoint, such a lunar outpost will be prohibitively expensive as thousands of tonnes of equipment will need to be launched to the Earth’s only natural satellite.

Missions to the Moon are less expensive with robots

Foust 06’ by Jeff Foust (Jeff Foust (jeff@thespacereview.com) is the editor and publisher of The Space Review. He also operates the Spacetoday.net web site and the Space Politics and Personal Spaceflight weblogs. Views and opinions expressed in this article are those of the author alone, and do not represent the official positions of any organization or company, including the Futron Corporation, the author’s employer.), Monday, December 11, 2006 <http://www.thespacereview.com/article/764/1>“Moonbase why”

Human spaceflight advocates typically counter that humans are much more capable than robots. That’s certainly true, but they’re also much more expensive, and for many missions the general public would be perfectly satisfied with the lower, but less expensive, scientific output provided by robots. The problem with relying on science as the primary reason for human lunar exploration is that, in the eyes of many, science can be done for far less money by robotic missions—which also don’t put human lives at risk. “Manned moon flight may appeal to baby boomers, but it makes little scientific sense for most space missions these days,” the Los Angeles Times concluded in an editorial Sunday. “Robots can now perform, or be developed to perform, most of the tasks people would do at a moon station.” Similarly, an editorial Saturday in the Minneapolis Star Tribune stated, “Today’s best investments in space exploration lie in extending the reach of uncrewed probes like the Mars Global Surveyor.”

The public doesn’t support any lunar exploration

Foust 06’ by Jeff Foust (Jeff Foust (jeff@thespacereview.com) is the editor and publisher of The Space Review. He also operates the Spacetoday.net web site and the Space Politics and Personal Spaceflight weblogs. Views and opinions expressed in this article are those of the author alone, and do not represent the official positions of any organization or company, including the Futron Corporation, the author’s employer.), Monday, December 11, 2006 <http://www.thespacereview.com/article/764/1>“Moonbase why”

Sort of like, say, the International Space Station? We’ve seen how well that’s worked, both in space and in foreign relations. The idea of having countries work together to explore the universe is certainly an honorable cause, but it should be a side benefit of the exploration, rather than one of the primary justifications itself. Similarly, the public engagement theme argues that human lunar exploration program will “encourage students and help develop the high-tech workforce”, another familiar argument for those who have followed the various justifications for the space program over the years. Like international cooperation, encouraging students to study math and science is important and a nice side benefit of any exploration program, but hardly a justification for the program itself. Under economic expansion, NASA makes the argument that a Moon base and ancillary activities will provide “benefits to life on the home planet”. That phrase sounds perilously close to the old, tired spinoff justification for the space program, and, in fact, in the brief video associated with this theme the narrator mentions that lunar exploration “also fosters innovations that benefit our society and economy.” Fortunately, though, NASA’s vision here is broader than spinoffs: the agency is pitching the Moon as a new economic frontier, a place for companies to do business and develop products and services. Like international cooperation, encouraging students to study math and science is important and a nice side benefit of any exploration program, but hardly a justification for the program itself. There are certainly proposals for businesses based on lunar resources, from searching from platinum-group metals deposited by impacting meteorites to beaming solar power back to Earth (and, of course, everyone’s favorite lunar resource, helium-3, ready for the taking on the Moon once we get around to developing fusion reactors.) However, many of these ideas are many years, if not decades, away from fruition, if they are even feasible in the first place. Moreover, these potential new industries will have to struggle with the high costs of space transportation, something the Vision does little, if anything, to address. “The human inhabitation of space in any significant numbers won’t happen until someone can tackle the costs of getting astronauts the first hundred miles up,” an editorial in USA Today last week noted. That leaves us with one final theme, boldly titled human civilization. It is, as NASA puts it, to “extend human presence to the Moon to enable eventual settlement.” That’s a theme that current NASA administrator Mike Griffin has pushed since taking office, talking about the need for humanity to become a “multiplanet species”. It’s also a theme that appeals to many die-hard space activists, who were sold on the idea thanks to decades of science fiction tales or through the efforts of Gerard O’Neill and his space colony concepts. (Nevermind that terms like “colony” and “colonization”, while used in some media accounts of NASA’s plans, have a somewhat negative, or at least politically incorrect, connotation these days because of their association with European colonial era on Earth.) The importance of expanding humanity beyond the Earth is undeniable: if humans remain solely on the Earth, the species is vulnerable to a natural or artificial catastrophe. Yet there’s a danger here of looking a bit too escapist. Some will wonder why NASA is spending so much to provide a second home for humanity (one that will only support a handful of people, and won’t be self-sufficient for years, if ever) when that money could be spent to improve life on Earth. Crafting a better answer to why So how should NASA justify its plans for human lunar exploration—or is there any justification at all? That argument is beyond the scope of this essay, but some patterns and approaches do emerge should NASA want to strengthen its reasons for returning to the Moon. If NASA is still struggling to answer the why question when a new president takes office, he or she is more likely to shift NASA’s focus in a different direction. To begin with, NASA should tighten the list of themes it’s developed. The foreign policy and “public engagement” themes don’t fit well as justifications for lunar exploration: they’re nice things to happen along the way, but selling a return to the Moon on the basis of improving relations with Europe or Russia, or encouraging students to do their math homework, won’t do anyone any good. Science, while important, shouldn’t be seen as the primary or exclusive reason for lunar exploration; otherwise, it would be too easy to replace human missions with robotic ones that, while perhaps less capable, would be far less expensive, a tradeoff many in the general public would be happy to make. That leaves science standing alongside economic expansion, exploration preparation, and preserving human civilization. Is there a way to wrap these themes together into an overall rationale that can win over, if not everyone, a significant fraction of the American public, not to mention key lawmakers? That’s the challenge that NASA and its supporters face over the next two years. If NASA is still struggling to answer the why question when a new president takes office, he or she is more likely to shift NASA’s focus in a different direction. The focus at last week’s press conference on how and where NASA will establish a lunar base was to some degree misplaced. Those plans will almost certainly not be implemented through no fault of the agency itself: they will be superseded by changes in technologies, approaches, and scientific knowledge of the Moon. However, what is certain is that those plans, or anything resembling them, will never come to pass if NASA cannot clearly explain to the public why humans should return to the Moon.