## Plan

### The United States federal government should implement the 2004 Vision for Space Exploration

## \*\*\*Inherency\*\*\*

### Obama’s space policy is not the VSE

Faith technology consultant and Adjunct Fellow for Space Initiatives at CSIS 2010 G. Ryan Space Review 4/26 http://www.thespacereview.com/article/1616/1

President Obama’s new policy reflects the findings of the Review of US Human Space Flight Plans Committee (also known as the Augustine Committee). The Augustine Committee found that the Constellation program was over budget and behind schedule, although the extent to which this is either a result of underfunding and the normal teething pains associated high technology procurement, or is symptomatic of poor technological decisions, is beyond the scope of this article. What is clear is that interactions among the White House, Congress, the Office of Management and Budget (OMB), and NASA tightened the program’s time and cost constraints, making it ultimately unsustainable politically and programmatically. Although President Obama’s new plan represents a sharp departure from the Constellation program, begun under the previous administration, the new policy follows much of the same thinking that appears in President Bush’s 2004 Vision for Space Exploration.

President Obama’s new plan modifies President Bush’s Vision for Space Exploration (VSE) by changing the approach to crew and cargo transportation to low Earth orbit (LEO). In the previous plan, NASA was to develop its own crew transportation system, comprised of two different rockets and a crew capsule, to send astronauts to LEO, including to the International Space Station (ISS). The capsule component would be augmented over time to provide a deep space transportation capability. Simultaneously, commercial transportation capabilities would be allowed to evolve, eventually taking over responsibility for crew transportation to LEO. The plan announced by President Obama makes reliance on commercial transportation of crew to LEO the primary plan, while retaining a secondary NASA-developed crew capability by pursuing the immediate development of an “Orion-lite” lifeboat that would be launched as an unmanned vehicle but could return crew from the ISS to Earth. The Orion-lite could, in addition to being evolved for deep-space travel, also be modified to transport crew to LEO, in the event that commercial systems are not able to meet that need.

Specifically – it excludes the primary goal of a lunar base

Faith technology consultant and Adjunct Fellow for Space Initiatives at CSIS 2010 G. Ryan Space Review 4/26 http://www.thespacereview.com/article/1616/1

President Obama’s April 15th statement that the establishment of a base on the Moon would no longer be considered the primary near- to medium-term objective of the American human spaceflight program has generated some controversy. Instead, President Obama has made rendezvous with and landing on an asteroid in 2025 the next major goal for NASA. From there, NASA will continue with further deep space exploration, leading to a human mission to orbit Mars in the 2035 timeframe, with a landing to follow at some point thereafter. Those who have followed the deliberations of the Augustine Committee closely should not find this surprising, as the committee exhibited a preference for what it called the “Flexible Path to inner solar system locations, such as lunar orbit, Lagrange points, near-Earth objects and the moons of Mars, followed by exploration of the lunar surface and/or Martian surface.” There has been much discussion about whether either the older or newer approach presents viable objectives for space exploration. The newer Flexible Path approach has met with some resistance, owing in part to its perceived lack of concrete details and milestones, and, as a consequence, may be more difficult to sustain politically over the longer term.

# \*\*\*LUNAR BASE ADV\*\*\*

## Lunar Base Adv – 1AC

### Vision for Space Exploration establishes a framework for sustainable exploration of the universe – its incremental strategy starts with a lunar base and remedies the inadequacies of status quo exploration strategies

Spudis MS in Planetary Geology PhD Geology & Lavoie NASA Marshall Space Flight Center 2010 Paul & Tony

“Mission and Implementation of an Affordable Lunar Return” Submitted to Space Manufacturing

http://www.spudislunarresources.com/Papers/Affordable\_Lunar\_Base.pdf

A key part of the 2004 Vision for Space Exploration (VSE) – the long-range strategic path to extend human reach beyond low Earth orbit – was learning how to use off-planet material and energy resources to create new space faring capability. Because it contains the raw materials needed to do this and because we know quite a bit about it already, these techniques were to be applied first on our nearby Moon. The Moon’s proximity and accessibility allows us to conduct a significant amount of this work in relative safety with robotic machines teleoperated from Earth and from cislunar space prior to human arrival.

Despite the advantages offered by this approach, implementation of the VSE floundered for several reasons. From the beginning, the National Aeronautics and Space Administration (NASA) did not embrace or understand the basic mission of the VSE, despite its clear articulation in both its founding documents and subsequent elaboration of the mission by many observers. The architecture the agency produced (the Exploration Systems Architecture Study or ESAS), while being technically capable of eventual lunar return, had the disadvantage of requiring more funding that could be made available within the time frame envisioned. The ESAS study was adopted as Project Constellation with relatively little consideration of possible alternatives and quickly became a programmatic straightjacket. For many, the ESAS became conflated with the VSE, but they are now (and have always been) separate and distinct – the ESAS is the architecture that the agency created to implement the VSE. ESAS is not the VSE and vice versa.

As budgetary problems with Constellation developed over time, it became a common contention that the VSE (Vision) in general and lunar return in particular was “unaffordable.” This meme was cemented into the report of the Augustine Committee, which claimed that no path exists to get back to the Moon under the existing budgetary environment. In fact, that committee was presented with at least three alternative architectures that would have resulted in an affordable path to lunar return. As the imminent retirement of the Space Shuttle will leave the nation without an American system to access space, most of the work of the committee focused on launch vehicles. The selections and choices made in that decision process will have significant impact on our future space capabilities and thus, should receive careful consideration from a variety of perspectives, not simply from the viewpoint of making and operating the next American launch vehicle.

In large part, the VSE was not properly implemented because of uncertainty about the objectives of our national space program. The objective of the Vision was not a series of Apollo-style expeditions or a human Mars mission but rather something more ambitious and permanent. The goal of the Vision for Space Exploration was nothing less than the extension of human reach to all of the Solar System, for the myriad of purposes imagined over many years. The high cost of launch to orbit is one barrier to widespread activity in space. However, despite numerous and continued attempts to lower launch costs over the last 30 years, a cost plateau has been reached at around $5000/kg (based on the price of the two cheapest existing launch services, India’s PSLV and SpaceX’s Falcon 9.) Launch cost is a “Catch-22” problem: costs are high because volume (traffic to LEO) is low and volume is low because costs are high. In the future we may expect to see some improvement in launch cost numbers but a drop by factors of 2 or 3 (rather than by orders of magnitude) is most likely.

The VSE sought to break this impasse. In Situ Resource Utilization (ISRU) is a new and different approach that involves learning how to use what we find in space to sustain and extend our presence there. In contrast to the problem of launch cost, this approach has only recently been seriously considered. The architects of the VSE specifically included a return to the Moon as the first destination beyond low Earth orbit because of its resource characteristics and its proximity. Our objective in returning to the Moon is to learn how to live and work productively on another world. The Moon possesses the material and energy resources necessary to learn new skills to create new space faring capabilities. Its proximity to the Earth permits easy and routine access to its surface.

These goals are very ambitious and quite unlike those of any previous space program so there is no a priori guarantee of success. Lunar return under the VSE is an engineering research and development project; it is not known how difficult the extraction and use of off-planet resources might be. But because the amount of leverage provided through the use of space resources is so great, this effort is a task worth attempting. If the ultimate rationale for human spaceflight is to create new reservoirs of culture off-planet, it follows that learning to adapt and use the resources of space becomes essential and a critical skill necessary for the future survival of the human race.

## Lunar Base Adv – 1AC

### VSE provides a clear directive and architecture – key to successful lunar base

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Starting in 2004, NASA hosted a number of retreats, workshops, conferences and meetings to discuss and describe possible lunar surface activities. The planning activities were so inclusive and the resulting wish list of experiments and activities became so immense that a clear mission objective for lunar return became impossible to state. We believe that a critical (if not the most critical) problem with the ESAS architecture is its failure to specifically understand, articulate and design to a “mission” on the lunar surface. In this context, we mean a clear statement that encompasses the strategic goals, objectives and activities of establishing a presence on the surface of the Moon.

The mission statement of lunar return is provided by the VSE founding documents: We go to the Moon to learn how to live and work productively on another world. We do this by using the material and energy resources of the lunar surface to create a sustained human presence there. Specifically, we will harvest the abundant water ice present at the lunar poles with the objective of making consumables for human residence on the lunar surface, and propellant, initially for access to and from the Moon, increasing the production with time for eventual export to support activities in cislunar space. The availability of lunar consumables allows us to routinely access all the levels of cislunar space where our economic, national security and scientific satellites reside.

This mission objective doesn’t just imply but rather defines the architecture of lunar return. We stay in one place to build up capabilities and infrastructure in order to stay longer and create more. Thus, we build an outpost; we do not conduct sorties (see Clarke, 1951). We go to the poles of the Moon for three reasons: 1) near-permanent sunlight near the poles permits almost constant generation of electrical power from photovoltaics, obviating the need for a nuclear reactor to survive the 14-day lunar night; 2) these quasi-permanent lit zones are thermally benign compared to equatorial regions (Apollo sites), being illuminated at grazing solar incidence angles and thus greatly reducing the passive thermal loading from the hot lunar surface; 3) the permanently dark areas near the poles contain significant quantities of volatile substances, including hundreds of millions of metric tonnes of water ice.

We plan to return to the Moon gradually and in stages, making use of existing assets both on Earth and in space. We emplace small robotic assets on the lunar surface first. These robots will establish a communication/navigation satellite system around the Moon, prospect for promising volatile deposits, conduct demonstration experiments to document the physical state and extraction potential of water, and conduct the initial preparation of the outpost site. In the second phase, larger, more capable robotic machines (also operated from Earth but with more autonomy) will begin production of water in quantity, emplace a habitat, prepare roads and landing pads, erect solar cell arrays and thermal control systems, and deploy surface communications systems. In the third phase, humans arrive on the Moon, where they live in a pre-emplaced outpost and begin using previously landed robotic machines to increase production and extend operations. This work proceeds as resources and technical development permit; schedule is the free variable. In the fourth stage, we produce surplus water that is exported to cislunar space (e.g., Earth-Moon L-1) for processing into propellant and other products.

## Lunar Base Adv – 1AC

### Lunar base is independently key to human survival

Shapiro Prof Emeritus & Snr Research Scientist - Chemistry at NYU 2007 Robert Space Review http://www.thespacereview.com/article/832/1

I am not writing here to add my voice to the chorus of Moon-bashers, but to express my astonishment that NASA, and most supporters of space, have overlooked the one goal that, even if taken alone, would justify the massive cost of a permanent lunar base: insuring the survival of our species, and of the civilization that sustains us.

Each year I insure my home for perhaps one percent of its value, and use a smaller amount to rent a safe deposit box to store valuable documents. What value do we place on our entire scientific, medical, and technical literature, together with our literary, artistic, and musical heritage? To raise the stakes, let me add the value of our own lives and those of all of our unborn descendents. This possibility was described eloquently more than two decades ago by Johnathan Schell in his anti-nuclear was treatise The Fate of the Earth. In his words: “But although the untimely death of everyone in the world would in itself constitute an unimaginably huge loss, it would bring with it a separate, distinct loss that would be in a sense even huger-the cancellation of all future generations of human beings.”

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

Suppose we wanted to conjure up a recipe for human disaster. Here is my suggestion about steps that we might take:

(1) Let the population swell up to seven billion or more. Then we will need vast and complex systems to ensure the production of food, materials, and energy sources, as well as transportation to deliver the goods. By increasing our numbers, we will also increase the playing field in which new viruses can develop, increase pollution and the probability of dramatic climate change, and hasten the day when important natural resources are exhausted.

(2) Computerize the operation of the food, energy, and transportation systems, and store all of the instruction manuals and needed references within the computers. Similarly, place all of our scientific, technical and medical knowledge within computers. Make the computers more and more complicated, so that only a handful of experts are prepared to deal with a massive failure.

(3) Arrange to have the computers, and most other functions of society, dependent upon the operations of an intricate power grid that is subject to massive and unexplained failure. We have already had a rehearsal of such an event. For example, on August 14, 2003, 50 million people in the northeast United States were deprived of power for many hours. The main cause of the blackout, according to the task force charged with its investigation, was the failure of an Ohio power company to trim trees in part of its service area. In September of that year, a similar blackout shut off power to almost all of Italy and part of Switzerland. Unintended causes might of course be eclipsed by the deliberate actions of terrorists. Gregory McNeal estimated in the New York Times that “a coordinated attack on four or five critical sites could send much of the nation into darkness for weeks.”

(4) Streamline the production of nuclear and biological weapons so that they become available not only to most heads of state, but also to groups of religious zealots and of extreme nationalists. Encourage both the exchange of information about such weapons, and their availability on the international black market. Individuals who are technically competent but mentally unbalanced will then also have access to such weapons, enriching their current arsenal of computer viruses, bombs, and hijacked airplanes.

All of the above events have already taken place or are likely to occur in the near future. We may also expect that single disasters may trigger a cascade of others. For example, my local power company has circulated a card advising its customers to assemble “at least a three-day supply of water and non-perishable food” as part of a “family emergency preparedness plan”. But what would we do, in urban centers, when that supply was exhausted but power and transportation had not been restored? Looting of stores and warehouses might be expected, together with an attempt by residents to flee to less populated areas where conditions might be better. Famine and civic disorder will inevitably produce casualties; unburied bodies could then lead to disease epidemics.

Considerations of this type led Dr. Martin Rees, Professor of Cosmology at Cambridge and President of the Royal Society, to publish a gloomy estimate. In his 2003 book, Our Final Hour, he gave civilization only a 50-percent chance of surviving until the year 2100.

When we face a brand new situation, such probabilities are impossible to calculate. Countermeasures against each individual threat can of course be taken, but we would also be prudent to back up our civilization and our species. We need to place a self-sufficient fragment of society out of harm’s way, which for practical purposes means off the Earth. A buffer of empty space would protect that sanctuary from virtually all of the catastrophes named above.

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

## Satellites Scenario – 1AC

### American satellite systems are vulnerable to accidents and attack

Spudis MS in Planetary Geology PhD Geology 2010 Paul Space Ref http://www.spaceref.com/news/viewnews.html?id=1376

Most people don't realize how the many satellites in various orbits around the Earth affect their lives. We rely on satellites to provide us with instantaneous global communications that impact almost everything we do. We use GPS to find out both where we are and where we are going. Weather stations in orbit monitor the globe, alerting us to coming storms so that their destructive effects can be minimized. Remote sensors in space map the land and sea, permitting us to understand the distribution of various properties and how they change with time. Other satellites look outward to the Sun, which controls the Earth's climate and "space weather" (which influences radio propagation.) No aspect of our lives is untouched by the satellites orbiting the Earth. In a real sense, they are the "Skynet" of the Terminator movies - they are our eyes (reconnaissance), ears (communications) and brains (GPS and Internet) in Earth orbit. Fortunately, they are not yet self-aware. But the people who operate them are.

All satellites are vulnerable. Components constantly break down and must be replaced. New technology makes existing facilities obsolete, requiring replacement, at high cost. A satellite must fit within and on the largest launch vehicle we have; satellites thus have a practical size limit, which in turn limits their capabilities and lifetime. Once a satellite stops working, it is abandoned and a replacement must be designed, launched and put into its proper orbit.

Satellite aging is normal and expected but satellites can also be catastrophically lost or disabled, either accidentally or deliberately. Encounters between objects in space tend to be at very high velocities. The ever-increasing amounts of debris and junk in orbit (e.g., pieces of old rockets and satellites) can hit functioning satellites and destroy them. NORAD carefully tracks the bigger pieces of junk and some spacecraft (e.g., ISS) can be maneuvered out of the path of oncoming debris, but smaller pieces (e.g., the size of a bolt or screw) cannot be tracked and if they collide with a critical part, it can cripple a satellite.

It has long been recognized that satellites are extremely vulnerable to attack and anti-satellite warfare (ASAT) is another possible cause of failure. Both the US and the USSR experimented with ASAT warfare during the Cold War. Although it sounds exotic, ASAT merely takes advantage of the fragility of these spacecraft to render them inoperative. This can be done with remote affecters like lasers to "blind" optical sensors. The simplest ASAT weapon is kinetic, i.e., an impactor. By intercepting a satellite with a projectile at high relative velocity, the satellite is rapidly and easily rendered worthless.

### VSE key to maintaining and access our satellite systems in the case of accidents or attacks

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http://www.spudislunarresources.com/Papers/Affordable\_Lunar\_Base.pdf

Establishing a permanent foothold on the Moon opens the space frontier to many parties for many different purposes. By creating a reusable, extensible cislunar space faring system, we build a “transcontinental railroad” in space, connecting two worlds (Earth and Moon), as well as enabling access to all points in between. We will have a system that can access the entire Moon, but more importantly, we will have the capability to routinely access all of our space assets within cislunar space (Spudis, 2010): communications, GPS, weather, remote sensing and strategic monitoring satellites. These satellites will then be in reach to be serviced, maintained and replaced as they age.

## Satellites Scenario – 1AC

### Satellite systems are key to hegemony the economy

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

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

## Satellites Scenario – 1AC

### Satellite failure cripples the global economy

Dillow Researcher – Popular Science Magazine, 2010 Clay, “Pentagon: A Space Junk Collision Could Set Off Catastrophic Chain Reaction, Disable Earth Communications”, Popsci, 5-27, http://www.popsci.com/technology/ article/2010-05/dod-space-junk-tipping-point-collision-could-set-catastrophic-chain-reaction

Our reliance on satellites goes beyond the obvious. We depend on them for television signals, the evening weather report, and to find our houses on Google Earth when we're bored at work. But behind the scenes, they also inform our warfighting capabilities, keep track of the global shipping networks that keep our economies humming, and help us get to the places we need to get to via GPS.

According to the DoD's interim Space Posture Review, that could all come crashing down. Literally. Our satellites are sorely outnumbered by space debris, to the tune of 370,000 pieces of junk up there versus 1,100 satellites. That junk ranges from nuts and bolts lost during spacewalks to pieces of older satellites to whole satellites that no longer function, and it's all whipping around the Earth at a rate of about 4.8 miles per second.

The fear is that with so much junk already up there, a collision is numerically probable at some point. Two large pieces of junk colliding could theoretically send thousands more potential satellite killers into orbit, and those could in turn collide with other pieces of junk or with satellites, unleashing another swarm of debris. You get the idea.

To give an idea of how quickly a chain reaction could get out hand consider this: in February of last year a defunct Russian satellite collided with a communications satellite, turning 2 orbiting craft into 1,500 pieces of junk. The Chinese missile test that obliterated a satellite in 2007 spawned 100 times more than that, scattering 150,000 pieces of debris.

If a chain reaction got out of control up there, it could very quickly sever our communications, our GPS system (upon which the U.S. military heavily relies), and cripple the global economy (not to mention destroy the $250 billion space services industry), and whole orbits could be rendered unusable, potentially making some places on Earth technological dead zones.

### Economic collapse leads to great power wars

Auslin Resident Scholar AEI 2009 Michael, Resident Scholar – American Enterprise Institute, and Desmond Lachman – Resident Fellow – American Enterprise Institute, “The Global Economy Unravels”, Forbes, 3-6, http://www.aei.org/article/100187

What do these trends mean in the short and medium term? The Great Depression showed how social and global chaos followed hard on economic collapse. The mere fact that parliaments across the globe, from America to Japan, are unable to make responsible, economically sound recovery plans suggests that they do not know what to do and are simply hoping for the least disruption. Equally worrisome is the adoption of more statist economic programs around the globe, and the concurrent decline of trust in free-market systems. The threat of instability is a pressing concern. China, until last year the world's fastest growing economy, just reported that 20 million migrant laborers lost their jobs. Even in the flush times of recent years, China faced upward of 70,000 labor uprisings a year. A sustained downturn poses grave and possibly immediate threats to Chinese internal stability. The regime in Beijing may be faced with a choice of repressing its own people or diverting their energies outward, leading to conflict with China's neighbors. Russia, an oil state completely dependent on energy sales, has had to put down riots in its Far East as well as in downtown Moscow. Vladimir Putin's rule has been predicated on squeezing civil liberties while providing economic largesse. If that devil's bargain falls apart, then wide-scale repression inside Russia, along with a continuing threatening posture toward Russia's neighbors, is likely. Even apparently stable societies face increasing risk and the threat of internal or possibly external conflict. As Japan's exports have plummeted by nearly 50%, one-third of the country's prefectures have passed emergency economic stabilization plans. Hundreds of thousands of temporary employees hired during the first part of this decade are being laid off. Spain's unemployment rate is expected to climb to nearly 20% by the end of 2010; Spanish unions are already protesting the lack of jobs, and the specter of violence, as occurred in the 1980s, is haunting the country. Meanwhile, in Greece, workers have already taken to the streets. Europe as a whole will face dangerously increasing tensions between native citizens and immigrants, largely from poorer Muslim nations, who have increased the labor pool in the past several decades. Spain has absorbed five million immigrants since 1999, while nearly 9% of Germany's residents have foreign citizenship, including almost 2 million Turks. The xenophobic labor strikes in the U.K. do not bode well for the rest of Europe. A prolonged global downturn, let alone a collapse, would dramatically raise tensions inside these countries. Couple that with possible protectionist legislation in the United States, unresolved ethnic and territorial disputes in all regions of the globe and a loss of confidence that world leaders actually know what they are doing. The result may be a series of small explosions that coalesce into a big bang.

## Satellites Scenario – Ext

### VSE 🡺 new paradigm for satellite development

Spudis MS in Planetary Geology PhD Geology 2010 Paul Space Ref http://www.spaceref.com/news/viewnews.html?id=1376

The goal of the VSE is to create the capability to live ON the Moon and OFF its local resources with the goals of self-sufficiency and sustainability, including the production of propellant and refueling of cislunar transport vehicles. A system that is able to routinely go to and from the lunar surface is also able to access any other point in cislunar space. We can eventually export lunar propellant to fueling depots throughout cislunar space, where most of our space assets reside. In short, by going to the Moon, we create a new and qualitatively different capability for space access, a "transcontinental railroad" in space. Such a system would completely transform the paradigm of spaceflight. We would develop serviceable satellites, not ones designed to be abandoned after use. We could create extensible, upgradeable systems, not "use and discard." The ability to transport people and machines throughout cislunar space permits the construction of distributed instead of self-contained systems. Such space assets are more flexible, more capable and more easily defended than conventional ones.

## Satellites Scenario – Heg Internal

### Satellite systems are key to hegemony

Young Chair – Institute for Defense Analyses Research Group, et al., 2008 A. Thomas, “Leadership, Management, and Organization for National Security Space”, July, http://www.armyspace.army.mil/ASJ/Images/National\_Security\_S pace\_Study\_Final\_Sept\_16.pdf

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. The military use of space-based capabilities is becoming increasingly sophisticated, and their use in Operation Enduring Freedom and Operation Iraqi Freedom is pervasive.

## Space Leadership Scenario – 1AC

### Winning the race to the Moon is key to hard and soft power

Spudis MS in Planetary Geology PhD Geology 2010 Paul Space Ref http://www.spaceref.com/news/viewnews.html?id=1376

In this interpretation, the Apollo program achieved not only its literal objective of landing a man on the Moon (propaganda, soft power) but also its more abstract objective of intimidating our Soviet adversary (technical surprise, hard power). Thus, Apollo played a key role in the end of the Cold War, one far in excess of what many scholars believe. Similarly, our two follow-on programs of Shuttle and Station, although fraught with technical issues and deficiencies as tools of exploration, had significant success in pointing the way towards a new paradigm for space. That new path involves getting people and machines to satellite assets in space for construction, servicing, extension and repair. Through the experience of ISS construction, we now know it is possible to assemble very large systems in space from smaller pieces, and we know how to approach such a problem. Mastery of these skills suggests that the construction of new, large distributed systems for communications, surveillance, and other tasks is possible. These new space systems would be much more capable and enabling than existing ones.

Warfare in space is not as depicted in science-fiction movies, with flying saucers blasting lasers at speeding spaceships. The real threat from active space warfare is denial of assets and access. Communications satellites are silenced, reconnaissance satellites are blinded, and GPS constellations made inoperative. This completely disrupts command and control and forces reliance on terrestrially based systems. Force projection and coordination becomes more difficult, cumbersome and slower.

Recently, China tested an ASAT weapon in space, indicating that they fully understand the military benefits of hard space power. But they also have an interest in the Moon, probably for "soft power" projection ("Flags-and-Footprints") at some level. Sending astronauts beyond low Earth orbit is a statement of their technical equality with the United States, as among space faring nations, only we have done this in the past. So it is likely that the Chinese see a manned lunar mission as a propaganda coup. However, we cannot rule out the possibility that they also understand the Moon's strategic value, as described above. They tend to take a long view, spanning decades, not the short-term view that America favors. Thus, although their initial plans for human lunar missions do not feature resource utilization, they know the technical literature as well as we do and know that such use is possible and enabling. They are also aware of the value of the Moon as a "backdoor" to approach other levels of cislunar space, as the rescue of the Hughes communications satellite demonstrated.

### VSE is key to winning the new space race

Spudis MS in Planetary Geology PhD Geology 2010 Paul Space Ref http://www.spaceref.com/news/viewnews.html?id=1376

There is indeed a new space race. It is just as important and vital to our country's future as the original one, if not as widely perceived and appreciated. It consists of a struggle with both hard and soft power. The hard power aspect is to confront the ability of other nations to deny us access to our vital satellite assets of cislunar space. The soft power aspect is a question: how shall society be organized in space? Both issues are equally important and both are addressed by lunar return. Will space be a sanctuary for science and PR stunts or will it be a true frontier with scientists and pilots, but also miners, technicians, entrepreneurs and settlers? The decisions made now will decide the fate of space for generations. The choice is clear; we cannot afford to relinquish our foothold in space and abandon the Vision for Space Exploration.

## Space Leadership Scenario – 1AC

### Now is key – leadership in exploration capabilities are key – China and Russia are looking to outpace the US

Wolf US Representative and Ranking Member – House Appropriations Committee 2010 Frank, “Don’t Forsake US Leadership in Space”, Space News, 4-25, http://spacenews.com/commentaries/100425-dont-forsake-leadership-space.html

Space exploration has been the guiding star of American innovation. The Mercury, Gemini, Apollo and shuttle programs have rallied generations of Americans to devote their careers to science and engineering, and NASA’s achievements in exploration and manned spaceflight have rallied our nation in a way that no other federal program — aside from our armed services — can.

Yet today our country stands at a crossroad in the future of U.S. leadership in space. President Barack Obama’s 2011 budget proposal not only scraps the Constellation program but radically scales back U.S. ambition, access, control and exploration in space. Once we forsake these opportunities, it will be very hard to win them back. As Apollo astronauts Neil Armstrong, Jim Lovell and Gene Cernan noted on the eve of the president’s recent speech at Kennedy Space Center, Fla.: “For The United States, the leading space faring nation for nearly half a century, to be without carriage to low Earth orbit and with no human exploration capability to go beyond Earth orbit for an indeterminate time into the future, destines our nation to become one of second or even third rate stature.”

In terms of national security and global leadership, the White House’s budget plan all but abdicates U.S. leadership in exploration and manned spaceflight at a time when other countries, such as China and Russia, are turning to space programs to drive innovation and promote economic growth.

Last month, China Daily reported that China is accelerating its manned spaceflight development while the U.S. cuts back. According to Bao Weimin with the Chinese Academy of Sciences, “A moon landing program is very necessary, because it could drive the country’s scientific and technological development.”

In a recent special advertising section in The Washington Post, the Russian government boasted of its renewed commitment to human spaceflight and exploration. Noting the White House’s recent budget proposal, the piece said, “NASA has long spent more money on more programs than Russia’s space agency. But President Barack Obama has slashed NASA’s dreams of going to the moon again. … At the same time, the Russian space industry is feeling the warm glow of state backing once again. There has been concerted investment in recent years, an investment that fits in well with the [Vladimir] Putin doctrine of trying to restore Russian pride through capacity.”

Manned spaceflight and exploration are one of the last remaining fields in which the United States maintains an undeniable competitive advantage over other nations. To walk away is shortsighted and irresponsible. Our global competitors have no intention of scaling back their ambitions in space.

James A. Lewis with the Center for Strategic and International Studies recently said that the Obama administration’s proposal is “a confirmation of America’s decline.”

The 2011 budget proposal guarantees that the United States will be grounded for the next decade while gambling all of our exploration money on unproven research-and-development experiments. Although I am an ardent supporter of federal R&D investments, I believe it is unacceptable that the administration would gamble our entire space exploration program for the next five years on research.

The dirty little secret of this budget proposal is that it all but ensures that the United States will not have an exploration system for at least two decades. That is a fundamental abdication of U.S. leadership in space — no matter how much the administration tries to dress it up. Our international competitors are not slowing down, and neither should we.

## Space Leadership Scenario – 1AC

Space leadership is key to warfighting capabilities

Young Chair – Institute for Defense Analyses Research Group, et al., 2008 A. Thomas, “Leadership, Management, and Organization for National Security Space”, July, http://www.armyspace.army.mil/ASJ/Images/National\_Security\_S pace\_Study\_Final\_Sept\_16.pdf

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.

### Lack of US superiority 🡺 multiple scenarios for nuclear conflict and terrorism

Arbatov Russian Academy of Sciences and Editor 2007 Alexei, Member Russia in Global Affairs, “Is a New Cold War Imminent?”, Russia in Global Affairs, 5(3), July / September, http://eng.globalaffairs.ru/numbers/20/1130.html

However, the low probability of a new Cold War and the collapse of American unipolarity (as a political doctrine, if not in reality) cannot be a cause for complacency. Multipolarity, existing objectively at various levels and interdependently, holds many difficulties and threats. For example, if the Russia-NATO confrontation persists, it can do much damage to both parties and international security. Or, alternatively, if Kosovo secedes from Serbia, this may provoke similar processes in Abkhazia, South Ossetia and Transdniestria, and involve Russia in armed conflicts with Georgia and Moldova, two countries that are supported by NATO. Another flash point involves Ukraine. In the event of Kiev’s sudden admission into the North Atlantic Alliance (recently sanctioned by the U.S. Congress), such a move may divide Ukraine and provoke mass disorders there, thus making it difficult for Russia and the West to refrain from interfering. Meanwhile, U.S. plans to build a missile defense system in Central and Eastern Europe may cause Russia to withdraw from the INF Treaty and resume programs for producing intermediate-range missiles. Washington may respond by deploying similar missiles in Europe, which would dramatically increase the vulnerability of Russia’s strategic forces and their control and warning systems. This could make the stage for nuclear confrontation even tenser. Other “centers of power” would immediately derive benefit from the growing Russia-West standoff, using it in their own interests. China would receive an opportunity to occupy even more advantageous positions in its economic and political relations with Russia, the U.S. and Japan, and would consolidate its influence in Central and South Asia and the Persian Gulf region. India, Pakistan, member countries of the Association of Southeast Asian Nations and some exalted regimes in Latin America would hardly miss their chance, either. A multipolar world that is not moving toward nuclear disarmament is a world of an expanding Nuclear Club. While Russia and the West continue to argue with each other, states that are capable of developing nuclear weapons of their own will jump at the opportunity. The probability of nuclear weapons being used in a regional conflict will increase significantly. International Islamic extremism and terrorism will increase dramatically; this threat represents the reverse side of globalization. The situation in Afghanistan, Central Asia, the Middle East, and North and East Africa will further destabilize. The wave of militant separatism, trans-border crime and terrorism will also infiltrate Western Europe, Russia, the U.S., and other countries. The surviving disarmament treaties (the Non-Proliferation Treaty, the Conventional Armed Forces in Europe Treaty, and the Comprehensive Nuclear Test Ban Treaty) will collapse. In a worst-case scenario, there is the chance that an adventuresome regime will initiate a missile launch against territories or space satellites of one or several great powers with a view to triggering an exchange of nuclear strikes between them. Another high probability is the threat of a terrorist act with the use of a nuclear device in one or several major capitals of the world.

### Nuclear terrorism causes extinction

Sid-Ahmed 04 (Mohamed Sid-Ahmed, Al-Ahram Weekly Online, Extinction!, August 26- September 1, 2004, <http://weekly.ahram.org.eg/2004/705/op5.htm>)

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

## Space Leadership Scenario– Capitalism Impact

### Beating China to the Moon is key to free market capitalism

Spudis MS in Planetary Geology PhD Geology 2010 Paul Space Ref http://www.spaceref.com/news/viewnews.html?id=1376

The struggle for soft power projection in space has not ended. If space resource extraction and commerce is possible, a significant question emerges - What societal paradigm shall prevail in this new economy? Many New Space advocates assume that free markets and capitalism is the obvious organizing principle of space commerce, but others might not agree. For example, to China, a government-corporatist oligarchy, the benefits of a pluralistic, free market system are not obvious. Moreover, respect for contract law, a fundamental reason why Western capitalism is successful while its implementation in the developing world has had mixed results, does not exist in China. So what shall the organizing principle of society be in the new commerce of space resources: rule of law or authoritarian oligarchy? An American win in this new race for space does not guarantee that free markets will prevail, but an American loss could ensure that free markets would never emerge on this new frontier.

## Space Coop Scenario – 1AC

### China is looking to cooperate with the US on space

Blair President World Security Institute & Yali editor-in-chief Washington Observer 2006 Bruce & Chen China Security Issue 2 http://www.chinasecurity.us/index.php?option=com\_content&view=article&id=426&Itemid=8

In spite of the bleak and deteriorating space relations between China and the United States, hope springs eternal in the essay by Sun Dang En, a research fellow of the Academy of Military Sciences. Sun’s hard-nosed realism acknowledges China’s uphill struggle to advance its progress in space and China’s need for support from international partners, especially the United States, to fulfill its ambitious quest. Like Chang, he disputes the allegations about China exploiting its manned space flight program for military purposes, adding to Chang’s points a rebuttal of the charge that the Shenzhou launch vehicle could be fitted with a warhead and serve as an advanced ballistic missile. Sun disputes this dubious charge on the persuasive grounds that this vehicle takes 20 hours to fuel (compared to U.S. and Russian missiles that are always ready for launch within minutes). He implies, correctly, that such lengthy preparations would be readily detectable and that a militarized Shenzhou rocket would be extremely vulnerable to a preemptive strike by U.S. or other forces. We (the editors) estimate that the combined surveillance, detection, and attack time of modern missile and aircraft forces in the U.S. arsenal is far shorter than the Chinese rocket’s fueling time alone.

### Unilateral abandonment of a lunar base created international instability in space cooperation – destroys space leadership

Newton Prof of Physics – U of Alabama Huntsville & Griffin Former Administrator – NASA and Eminent Scholar and Professor – U of Alabama, Huntsville 2011 Elizabeth & Michael “United States Space Policy and International Partnership”, Space Policy, 27(1), February, p. 8-9

The president’s request and congressional authorization for continued funding of the ISS’s operations delivers on commitments made to international partners beginning in the mid-1980s when the program was conceived. However, without a successor system to the Shuttle, the USA has abrogated intergovernmental agreements to provide crew and cargo transportation, and crew rescue, as partial compensation for partner investments in the ISS’s infrastructure and operations. Reliance on the Russian Soyuz for limited down-mass cargo transport seriously inhibits the value that can be realized from ISS utilization until a commercial solution is available. In addition, the USA’s unilateral abandonment of the Moon as a near-term destination shakes partners’ political support for their exploration plans, some of which were carefully premised on US intentions, and more than five years of collaborative development of lunar base plans.

3.3. Leadership

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

US/China space coop key to science diplomacy and to prevent space militarization

Rutkowski Masters Candidate Johns Hopkins University School of Advanced International Studies - Nanjing University Center for Chinese - American Studies 2008 Ryan The Prospect of US – China Collaboration for Manned-Space Exploration http://mysite.verizon.net/ryan.rutkowski/Blog/US-China%20Space%20cooperation.pdf

However, the continued reluctance to pursue U.S. and China space cooperation, ignores the benefits of such cooperation, namely promote mutual understanding, cost savings, improved transparency, and ensuring long-term gains in human space exploration. Similar with US-Russian cooperation, US-Chinese space cooperation will allow for a cultural exchange through collaboration with US and Chinese astronauts and scientists. China could be a vital source of funding to reduce the rising costs for an expanding U.S. space program. Indeed, China and the US could collaborate on joint-projects, such as ISS or even a lunar base that could help reduce the cost of investment in space exploration for both countries. US-China space collaboration would also reduce security tensions, especially in space-based weapons, by increasing transparency of the long-term intentions of both countries in space technology. Finally, U.S. and Chinese civilian space programs could recognize a common purpose and commitment to the development of space technology to promote progress in human space exploration to the moon, mars, and beyond. U.S-China space cooperation is vital to future progress in space technology and space exploration. The U.S. and China could engage in non-sensitive data and information sharing from satellites, such as debris management, environmental and meteorological conditions, and navigation. The two countries could also engage in a space policy dialogue similar to the annual strategic economic dialogue to build a better understanding of civilian and military space objectives and a common vision for space exploration initiatives. Finally, the U.S. and China could launch bi-lateral and multi-lateral joint-projects with ISS, lunar expeditions, and eventual mars exploration. Ultimately, the future of U.S.-China space cooperation is a necessity for continuation of human progress in exploring our planet, solar system, and worlds beyond.

## Space Coop Scenario – 1AC

### US-China Science Co-op actively stabilizes relations, regardless of other tensions, increases diplomacy and communication, and constructs future policy to ensure peace.

Cheryl Pellerin, Washington File Staff Writer, 15 April 2005 “China, United States Share Long History of Science Cooperation” http://www.america.gov/st/washfile-english/2005/April/20050415161251lcnirellep0.5653345.html

Washington -- U.S.-Chinese cooperation in science and technology over the last two decades has helped advance cooperative research in a range of fields and has had a stabilizing effect on the sometimes-volatile bilateral political relationship. Since 1979, when President Jimmy Carter and Premier Deng Xiaoping signed the U.S.-China Agreement on Cooperation in Science and Technology (S&T Agreement), researchers in both countries have officially collaborated in work involving fisheries, earth and atmospheric sciences, physics, chemistry, energy technologies, agriculture, geology, health and disaster mitigation. But the agreement – one of the longest-standing U.S.-China accords – does something more. According to a 2005 State Department report submitted to Congress, U.S.-China Science and Technology Cooperation, the agreement provides “an avenue for rational dialogue and communication regardless of other tensions” between the countries and gives the influential Chinese science community “a stake in maintaining a peaceful, constructive relationship with the U.S.” Under the S&T Agreement, U.S. federal agencies can negotiate specific protocols, memorandums of understanding and other limited agreements with Chinese government agencies. A State Department China desk officer estimated that the United States now has almost 30 active protocols and more than 60 subagreements with China. “Overall,” he said, “there’s a great deal of activity.”

### Science cooperation policies are actively key to conflict resolution, soft power, nuclear stability, arms control, and non-proliferation—US-China science engagement solves.

Michael Clegg ’08, Foreign Secretary for the National Academy of Sciences, July 15, 2008 “Statement of the national academy of sciences and international science and technology cooperation.” Pg.3-4 [mrl]

Often the Academies work with partners in regions of conflict thereby addressing an important scientific issue while also helping to create bridges of cooperation. Thus, for example, we have an ongoing program of cooperation with the academies of the Middle East. This effort began with cooperation on regional health challenges. It also included a project on water futures in the Jordan Valley, conducted jointly with the Israeli and Palestinian academies and the Higher Council of Jordan that resulted in the joint report entitled Water for the Future: The West Bank and Gaza Strip, Israel, and Jordan. This work has now matured into a series of joint activities that include projects on micronutrient deficiencies, water resources, renewable energy, pollution and land degradation and science education. An organization has been created to implement these programs provisionally named the “Association of Middle Eastern and US National Academies of Sciences”. Our Academies also host a meeting for young and mid career scientists from Jordan, Israel, Palestine and the United States aimed at sharing research knowledge and framing joint solutions to common problems. Why are the US Academies seen as effective conveners of activities in the Middle East? The principle answer is that the US scientific community is held in high esteem by all the societies of this conflicted region of the world. This respect for US science institutions is based on a widespread admiration for American accomplishments in STH fields and it opens doors that might otherwise be closed. Enhancing national and international security through increasing pathways of communication: Beginning in the early 1980s, the US National Academy of Sciences established a standing committee on International Security and Arms Control (CISAC) that worked with scientists in the Soviet Union and later in Russia on issues of nuclear stability, arms control and non-proliferation. The initial work was aimed at building mutual trust and respect, but ultimately this effort matured into a dialogue that was central to later arms reduction agreements. Current work with the Russian Academy focuses on topics such as international nuclear fuel cycle approaches, and the international nuclear security environment. Beyond cooperation with Russia, we convene dialogues in India on Indo-US cooperation in international security issues. We have a series of US-China engagements, one of the few sustained bilateral channels of nongovernmental communication on international and regional security issues, with an important set of Chinese scientists, nuclear weapons experts, and policy analysts. We participate in international fora aimed at enhancing biosecurity, both with the international community and in a bilateral context with the Chinese Academy of Sciences.

## Space Coop Scenario – 1AC

### Space militarization 🡺 great power wars and WMD use

Gordon Mitchell Associate Professor and Dir Debate – U Pittsburgh, Et al., ISIS Briefing on Ballistic Missile Defense, July 2001 http://www.isisuk.demon.co.uk/0811/isis/uk/bmd/no6.html

A buildup of space weapons might begin with noble intentions of 'peace through strength' deterrence, but this rationale glosses over the tendency that '… the presence of space weapons…will result in the increased likelihood of their use'.33 This drift toward usage is strengthened by a strategic fact elucidated by Frank Barnaby: when it comes to arming the heavens, 'anti-ballistic missiles and anti-satellite warfare technologies go hand-in-hand'.34 The interlocking nature of offense and defense in military space technology stems from the inherent 'dual capability' of spaceborne weapon components. As Marc Vidricaire, Delegation of Canada to the UN Conference on Disarmament, explains: 'If you want to intercept something in space, you could use the same capability to target something on land'. 35 To the extent that ballistic missile interceptors based in space can knock out enemy missiles in mid-flight, such interceptors can also be used as orbiting 'Death Stars', capable of sending munitions hurtling through the Earth's atmosphere. The dizzying speed of space warfare would introduce intense 'use or lose' pressure into strategic calculations, with the spectre of split-second attacks creating incentives to rig orbiting Death Stars with automated 'hair trigger' devices. In theory, this automation would enhance survivability of vulnerable space weapon platforms. However, by taking the decision to commit violence out of human hands and endowing computers with authority to make war, military planners could sow insidious seeds of accidental conflict. Yale sociologist Charles Perrow has analyzed 'complexly interactive, tightly coupled' industrial systems such as space weapons, which have many sophisticated components that all depend on each other's flawless performance. According to Perrow, this interlocking complexity makes it impossible to foresee all the different ways such systems could fail. As Perrow explains, '[t]he odd term "normal accident" is meant to signal that, given the system characteristics, multiple and unexpected interactions of failures are inevitable'.36 Deployment of space weapons with pre-delegated authority to fire death rays or unleash killer projectiles would likely make war itself inevitable, given the susceptibility of such systems to 'normal accidents'. It is chilling to contemplate the possible effects of a space war. According to retired Lt. Col. Robert M. Bowman, 'even a tiny projectile reentering from space strikes the earth with such high velocity that it can do enormous damage — even more than would be done by a nuclear weapon of the same size!'. 37 In the same Star Wars technology touted as a quintessential tool of peace, defence analyst David Langford sees one of the most destabilizing offensive weapons ever conceived: 'One imagines dead cities of microwave-grilled people'.38 Given this unique potential for destruction, it is not hard to imagine that any nation subjected to space weapon attack would retaliate with maximum force, including use of nuclear, biological, and/or chemical weapons. An accidental war sparked by a computer glitch in space could plunge the world into the most destructive military conflict ever seen.

## Space Coop Scenario – 1AC

### Space cooperation is key to solve US China war

Blair President World Security Institute & Yali editor-in-chief Washington Observer 2006 Bruce & Chen China Security Issue 2 http://www.chinasecurity.us/index.php?option=com\_content&view=article&id=426&Itemid=8

In the pioneering space war games played in recent years by American military strategists at U.S. space control headquarters in Colorado, the United States and China occupied center stage in hypothetical confrontations that put them on a collision course in the exosphere. These games play on the fault lines that underlie their space relations in the real world, the key features of which include: the massive dependency of the U.S. military on space assets, both military and commercial; the globalization of commercial space services by multinational corporations operating partially outside the jurisdiction of sovereign nations; the recognition by Chinese strategists that space dependency is a potential Achilles heel of an otherwise overpowering U.S. military juggernaut; the resurgence of extreme worst-case threat estimation in U.S. intelligence assessments; the emergence of China as the leading candidate to replace Russia as the next designated super-rival of the United States; and flash points prone to spark military hostilities over competing vital interests.

The volatility of this mixture produces unstable results in war games. In these mental exercises, events tend to rush headlong into conflict. In one exercise, a confrontation over an unnamed island state in the Pacific, obviously a notional proxy for Taiwan, rapidly escalated from diplomatic crisis to limited strikes against space assets to nuclear war. Other forms of instability lurking in this brew simply shut down another exercise – as happened when the players managing a large-scale U.S. military intervention to defend Taiwan discovered that their forces’ burgeoning appetite for commercial bandwidth for wartime military communications and reconnaissance operations vastly exceeded the available bandwidth. In this case, the notional adversary state, obviously representing China, managed to buy up long-term contracts with the multinational suppliers for the lion’s share of their surplus commercial capacity, leaving only bandwidth crumbs for foraging U.S.forces. This deficit of cyberspace brought the U.S. military goliath’s operations to a virtual standstill.

These war games point to latent tensions existing in the real world. Although that world today appears placid on the surface, the appearance is deceiving. Far from a vast expanse of tranquility, space is host to an expanding array of military operations and is becoming an arena of tension that mirrors earthly tensions among key nations. To avert the collision that this growing tension portends, the main interested parties – notably, China and the United States must squarely confront the adverse trends and devise new instruments of dialogue and cooperation.

### US/China war 🡺 extinction

Straits Times June 25, 2000 lexis

THE high-intensity scenario postulates a cross-strait war escalating into a full-scale war between the US and China. If Washington were to conclude that splitting China would better serve its national interests, then a full-scale war becomes unavoidable. Conflict on such a scale would embroil other countries far and near and -- horror of horrors -- raise the possibility of a nuclear war. Beijing has already told the US and Japan privately that it considers any country providing bases and logistics support to any US forces attacking China as belligerent parties open to its retaliation. In the region, this means South Korea, Japan, the Philippines and, to a lesser extent, Singapore. If China were to retaliate, east Asia will be set on fire. And the conflagration may not end there as opportunistic powers elsewhere may try to overturn the existing world order. With the US distracted, Russia may seek to redefine Europe's political landscape. The balance of power in the Middle East may be similarly upset by the likes of Iraq. In south Asia, hostilities between India and Pakistan, each armed with its own nuclear arsenal, could enter a new and dangerous phase. Will a full-scale Sino-US war lead to a nuclear war? According to General Matthew Ridgeway, commander of the US Eighth Army which fought against the Chinese in the Korean War, the US had at the time thought of using nuclear weapons against China to save the US from military defeat. In his book The Korean War, a personal account of the military and political aspects of the conflict and its implications on future US foreign policy, Gen Ridgeway said that US was confronted with two choices in Korea -- truce or a broadened war, which could have led to the use of nuclear weapons. If the US had to resort to nuclear weaponry to defeat China long before the latter acquired a similar capability, there is little hope of winning a war against China 50 years later, short of using nuclear weapons. The US estimates that China possesses about 20 nuclear warheads that can destroy major American cities. Beijing also seems prepared to go for the nuclear option. A Chinese military officer disclosed recently that Beijing was considering a review of its "non first use" principle regarding nuclear weapons. Major-General Pan Zhangqiang, president of the military-funded Institute for Strategic Studies, told a gathering at the Woodrow Wilson International Centre for Scholars in Washington that although the government still abided by that principle, there were strong pressures from the military to drop it. He said military leaders considered the use of nuclear weapons mandatory if the country risked dismemberment as a result of foreign intervention. Gen Ridgeway said that should that come to pass, we would see the destruction of civilization.

## Space Coop – Science Diplomacy Impact

### Science diplomacy solves international conflict

Himelfarb Associate Vice President, USIP, Center of Innovation for Science, Technology & Peacebuilding / Media, Conflict & Peacebuilding 2010 Sheldon Science Diplomacy and the Prevention of Conflict

http://uscpublicdiplomacy.org/media/Science%20Diplomacy%20Proceedings.pdf

These are exciting times for those of us working at the nexus of science diplomacy and peacebuilding. Rarely have we seen such high profile expressions of hope and support for science diplomacy as a tool of conflict management as we have lately. President Barack Obama, with his remarks in Cairo in 2009, not only tried to change the tone of our relationship with the Middle East and the Muslim world at large, but he gave science a prominent role in defining that new relationship. And last fall, Secretary of State Hillary Clinton appointed three scientific luminaries as “science envoys” to engage more extensively with the Muslim world in scientific and technical collaborations. Finally, in its recent budget the Administration followed through by requesting new funding for global engagement programs of this nature.

Clearly, our political leaders have great hopes that science diplomacy will help to ease tensions between the Western and Muslim worlds. And we see similar expressions of hope in other areas such as climate change and nuclear non-proliferation where science diplomacy can play a vital role in mitigating conflict.

## Space Coop Scenario – VSE Solves

### Key to international cooperation in space

Spudis MS in Planetary Geology PhD Geology & Lavoie NASA Marshall Space Flight Center 2010 Paul & Tony

“Mission and Implementation of an Affordable Lunar Return” Submitted to Space Manufacturing

http://www.spudislunarresources.com/Papers/Affordable\_Lunar\_Base.pdf

The modular, incremental nature of this architecture enables international and commercial participation to be easily and seamlessly integrated into our lunar return scenario. Because the outpost is built around the addition of capabilities through the use of small, robotically teleoperated assets, other parties can bring their own pieces to the table as time, availability and capability permit. International partners can contemplate their own human launch capability to the Moon without use of a Heavy Lift vehicle. This feature becomes politically attractive by simply providing lunar fuel for a return trip for the international partners. This flexibility makes international participation and commercialization in our architecture much more viable than was possible under the previous ESAS architecture.

## Space Coop Scenario – Relations ext

### Relations internal

Xiaobing researcher at the China Institute of Contemporary International Relations 2006 Guo China Security Issue 2 http://www.chinasecurity.us/index.php?option=com\_content&view=article&id=426&Itemid=8

The overall Sino-U.S. relationship is improving. The two nations have been cooperating closely in the global war against terror, the nuclear issue in the Korean peninsula, and on global security. Bilateral economic ties are closer than ever. Currently, 80 percent of Wal-Mart’s supplies come from China.16 U.S. Deputy Secretary of State Robert Zoellick’s characterization of China as a stakeholder instead of strategic competitor is accurate. U.S. insistence on isolating China in space is incongruous with the larger scheme of developing bilateral ties. Such a policy is an insult to the Chinese and has harmed the United States. It is high time the United States charts a new course and disposes of a policy that has not only failed in its goal of preventing China’s development in space, but has alienated China and fueled an adversarial relationship between the two countries.

### Space coop key to US/China relations

CNS News 10/20/10 http://www.cnsnews.com/news/article/nasa-head-s-visit-china-makes-republican

“U.S.-China space cooperation is an important piece of the U.S.-China bilateral relationship and we hope your trip proves successful,” Republican Reps. Mark Kirk (Ill.) and Charles Boustany (La.) and Democrat Rick Larsen (Wash.) said in a letter to the NASA head.

“In our view, space cooperation presents an opportunity to improve the diplomatic, political and military atmosphere between the United States and China.”

## Space Coop Scenario – China will Coop

### China says yes – they need the US

Blair President World Security Institute & Yali editor-in-chief Washington Observer 2006 Bruce & Chen China Security Issue 2 http://www.chinasecurity.us/index.php?option=com\_content&view=article&id=426&Itemid=8

In spite of the bleak and deteriorating space relations between China and the United States, hope springs eternal in the essay by Sun Dang En, a research fellow of the Academy of Military Sciences. Sun’s hard-nosed realism acknowledges China’s uphill struggle to advance its progress in space and China’s need for support from international partners, especially the United States, to fulfill its ambitious quest. Like Chang, he disputes the allegations about China exploiting its manned space flight program for military purposes, adding to Chang’s points a rebuttal of the charge that the Shenzhou launch vehicle could be fitted with a warhead and serve as an advanced ballistic missile. Sun disputes this dubious charge on the persuasive grounds that this vehicle takes 20 hours to fuel (compared to U.S. and Russian missiles that are always ready for launch within minutes). He implies, correctly, that such lengthy preparations would be readily detectable and that a militarized Shenzhou rocket would be extremely vulnerable to a preemptive strike by U.S. or other forces. We (the editors) estimate that the combined surveillance, detection, and attack time of modern missile and aircraft forces in the U.S. arsenal is far shorter than the Chinese rocket’s fueling time alone.

While rebutting allegations that China is advancing its military space program under the guise of a civilian mission, Sun acknowledges that Chinese opaqueness engenders suspicion: “At present, the main obstacle to Sino-U.S. cooperation on manned spaceflight is that the U.S. believes China’s space programs lack transparency and are controlled by the military.” Yet Sun finds cause for optimism in their space relations building upon recent friendly gestures such as the voluntary passing of information on space debris from the United States to China prior to the launch of Shenzhou VI. He calls upon both countries to expand their cooperation dramatically into a host of space activities dedicated to economic, human, and scientific development.

### Will coop

Blair President World Security Institute & Yali editor-in-chief Washington Observer 2006 Bruce & Chen China Security Issue 2 http://www.chinasecurity.us/index.php?option=com\_content&view=article&id=426&Itemid=8

The deployment of space weapons by any nation would cast a dark cloud over the future security of China and the world. The Chinese authors in this volume seem quite united in their view of the need to avoid crossing this threshold, and instead revive a spirit of international cooperation in space. That call, we believe, is sincere and places the ball in America’s court for now. China bears some responsibility, however, for clarifying its program, making its technologies as well as intentions more transparent, and encouraging both military and civilian policy analysts to study and debate publicly. China needs to address squarely how space will be used to strengthen its national security, and explain how exchanges and cooperation with the United States and others in space projects will not be exploited to obtain potential advantage over those partners. China and the United States should open new venues for dialogue at different levels, and build confidence through cooperation in apolitical matters such as data sharing in debris monitoring. The Chinese view of the paramount importance of the politico-strategic intentions behind space cooperation has merit. If China and other space-faring nations intend to pursue the peaceful use of space and seek cooperation for the benefit of mankind, then the time is ripe to reopen a constructive agenda of action as well as talk.

### China says yes to cooperation

Dangen senior research fellow at the Academy of Military Sciences 2006 Sun China Security Issue 2 http://www.chinasecurity.us/index.php?option=com\_content&view=article&id=426&Itemid=8

In the interest of peace and development of the world, China is very open-minded to cooperation in space. With a growing space program, China has every reason to desire cooperation with a space superpower like the United States. China sees great opportunity to enhance its capacities and the well being of its people through joint efforts to explore space and to utilize its resources peacefully. If the U.S. government wishes to demand concrete and reasonable concessions from the Chinese space program in exchange for such cooperation, it should consider those concessions carefully and present them for discussion. Such a position would be a welcome change from the current U.S. approach, which has been perceived by the Chinese as one of besieging, persecuting, blockading and intercepting Chinese institutions and ambitions.

## Global Warming Scenario – 1AC

### Lunar base is key to sun blocking shield – solves global warming

Worden Director - NASA Ames Research Center 2006 Simon Space Ref http://www.spaceref.com/news/viewnews.html?id=1119

Let me close my discussion of future possibilities with a rather encompassing idea. Global warming is a big deal as I'm sure you all know. Damage caused by global warming could run into tens of trillions of dollars over the next half century. Most solutions for this purported global warming - and again, this is an open scientific issue as to how much global warming there is and what causes it.

Most of the solutions proposed fall into either what I call the "grow strawberries in the backyard" School - or alternatively, the "return to nature" school or alternatively the complete restructure of the economy to use alternate fuels and so forth. Now, I think there is a third way on this.

A few years ago there was an episode of Star Trek - I'm sure no one here ever watched that! But the episode featured a super powerful creature named 'Q.' ["Deja Q"] He was on the starship Enterprise when a giant stellar fragment - whatever that is - was about to destroy the ship. Captain Picard - or was it Kirk? Asked him what he was going to do. Q said "simple, just change the gravitational constant." I and one of my former colleagues at the University of Arizona, Professor Roger Angel believe we can do the same for global warming. But in this case we simply change the solar constant to compensate for greenhouse warming. How do we do you think that we might do that?

Edward Teller and his colleagues, particularly a guy named James Early - had an answer. They said: build a giant shield 2,000 km across at the Earth-sun L-1 point to block a few percent of the solar input. This would obviously be an impossible task if launched with current technology from Earth. But it might be quite feasible if the material was obtained and launched from the moon - or if we use new launch technologies could even make it much more affordable to launch from Earth.

Roger Angel and I have expanded on the previous work. We believe that making the shields out of transmissive material and using many smaller shields rather than a single giant one would enable us to piecewise construct an affordable shield. This is still a massive undertaking requiring ten to twenty million tons of material or more at L-1 and millions of small blocker spacecraft.

### Global warming leads to extinction

Oliver Tickell, Climate Researcher, 8/11/2008, On a planet 4C hotter, all we can prepare for is extinction, The Guardian, Proquest

We need to get prepared for four degrees of global warming, Bob Watson told the Guardian last week. At first sight this looks like wise counsel from the climate science adviser to Defra. But the idea that we could adapt to a 4C rise is absurd and dangerous. Global warming on this scale would be a catastrophe that would mean, in the immortal words that Chief Seattle probably never spoke, "the end of living and the beginning of survival" for humankind. Or perhaps the beginning of our extinction. The collapse of the polar ice caps would become inevitable, bringing long-term sea level rises of 70-80 metres. All the world's coastal plains would be lost, complete with ports, cities, transport and industrial infrastructure, and much of the world's most productive farmland. The world's geography would be transformed much as it was at the end of the last ice age, when sea levels rose by about 120 metres to create the Channel, the North Sea and Cardigan Bay out of dry land. Weather would become extreme and unpredictable, with more frequent and severe droughts, floods and hurricanes. The Earth's carrying capacity would be hugely reduced. Billions would undoubtedly die. Watson's call was supported by the government's former chief scientific adviser, Sir David King, who warned that "if we get to a four-degree rise it is quite possible that we would begin to see a runaway increase". This is a remarkable understatement. The climate system is already experiencing significant feedbacks, notably the summer melting of the Arctic sea ice. The more the ice melts, the more sunshine is absorbed by the sea, and the more the Arctic warms. And as the Arctic warms, the release of billions of tonnes of methane – a greenhouse gas 70 times stronger than carbon dioxide over 20 years – captured under melting permafrost is already under way. To see how far this process could go, look 55.5m years to the Palaeocene-Eocene Thermal Maximum, when a global temperature increase of 6C coincided with the release of about 5,000 gigatonnes of carbon into the atmosphere, both as CO2 and as methane from bogs and seabed sediments. Lush subtropical forests grew in polar regions, and sea levels rose to 100m higher than today. It appears that an initial warming pulse triggered other warming processes. Many scientists warn that this historical event may be analogous to the present: the warming caused by human emissions could propel us towards a similar hothouse Earth.

## Global Warming Scenario – Turns the DA

Global warming leads to nuclear war

Dyer, PhD in Middle Eastern History, 2009

Gwynne, MA in Military History and PhD in Middle Eastern History former @ [Senior Lecturer](file://localhost/wiki/Senior_Lecturer) in War Studies at the [Royal Military Academy Sandhurst](file://localhost/wiki/Royal_Military_Academy_Sandhurst), Climate Wars

THIS BOOK IS AN ATTEMPT, peering through a glass darkly, to understand the politics and the strategies of the potentially apocalyptic crisis that looks set to occupy most of the twenty­first century. There are now many books available that deal with the science of climate change and some that suggest pos­sible approaches to getting the problem under control, but there are few that venture very far into the grim detail of how real countries experiencing very different and, in some cases, overwhelming pressures as global warming proceeds, are likely to respond to the changes. Yet we all know that it's mostly politics, national and international, that will decide the outcomes. Two things in particular persuaded me that it was time to write this book. One was the realization that the first and most important impact of climate change on human civiliza­tion will bean acute and permanent crisis of food supply. Eating regularly is a non-negotiable activity, and countries that cannot feed their people are unlikely to be "reasonable" about it. Not all of them will be in what we used to call the "Third World" -the developing countries of Asia, Africa and Latin America. The other thing that finally got the donkey's attention was a dawning awareness that, in a number of the great pow­ers, climate change scenarios are already playing a large and increasing role in the military planning process. Rationally, you would expect this to be the case, because each country pays its professional military establishment to identify and counter "threats" to its security, but the implications of their scenarios are still alarming. There is a probability of wars, including even nuclear wars, if temperatures rise two to three degrees Celsius. Once that happens, all hope of international cooperation to curb emissions and stop the warming goes out the window.

## Lunar Base - Solvency – 1AC

### VSE 🡺 R&D and space investment key to developing sustainable lunar development

Spudis MS in Planetary Geology PhD Geology & Lavoie NASA Marshall Space Flight Center 2010 Paul & Tony

“Mission and Implementation of an Affordable Lunar Return” Submitted to Space Manufacturing

http://www.spudislunarresources.com/Papers/Affordable\_Lunar\_Base.pdf

We have concentrated on the water production attributes of a lunar outpost because the highest leveraging capabilities that are most easily exploited are associated with the availability of propellant. However, there are other possibilities to explore, including the paradigm-shifting culture to eventually design all structural elements needed for lunar activities using lunar resources. These activities will spur new commercial space interest, innovation and investment. This further reduces the Earth logistics train and helps extend human reach deeper into space, along a trajectory that is incremental, methodical, sustainable and within projected budget expectations.

Instead of the current design-build-launch-discard paradigm of space operations, we can build extensible, distributed space systems, with capabilities much greater than currently possible. Both the Shuttle and ISS experience demonstrated the value of human construction and servicing of orbital systems. What we have lacked is the ability to access the various systems that orbit the Earth at altitudes much greater than LEO – in MEO, HEO, GEO and other locations in cislunar space.

A transportation system that can access cislunar space, can also take us to the planets. The assembly and fueling of interplanetary missions is possible using the resources of the Moon. Water produced at the lunar poles can fuel human missions beyond the Earth-Moon system, as well as provide radiation shielding for the crew, thereby greatly reducing the amount of mass needed to be launched from the Earth’s surface. To give some idea of the leverage this provides, it has been estimated that a chemically propelled Mars mission requires roughly one million pounds (about 500 metric tonnes) in Earth orbit. Of this mass, more than 80% is propellant. Launching such propellant from Earth requires more than five Ares V-class launches, at a cost of almost $2 billion each. This does not establish true exploration capability. A Mars mission staged from the facilities of a cislunar transport system can use the propellant of the Moon to reduce the needed mass launched from Earth by a factor of five.

This return to the Moon is affordable and can be accomplished on reasonable time scales. Instead of single missions to exotic destinations, where all hardware is discarded as the mission progresses, we instead focus on the creation of reusable and extensible space systems, flight assets that are permanent and useable for future exploration beyond LEO. In short, we get value for our money. Instead of a fiscal black hole, this extensible space program becomes a generator of innovation and national wealth. It is challenging enough to drive technological innovation (Table 4) yet within reach on a reasonable timescale.

### Recent data proves – the moon has adequate resources

Spudis MS in Planetary Geology PhD Geology & Lavoie NASA Marshall Space Flight Center 2010 Paul & Tony

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We desire to extend human reach in space beyond its current limit of low Earth orbit. The Moon has the material and energy resources needed to create a true space faring system. Recent data show the lunar surface richer in resource potential than we had thought; both abundant water and near-permanent sunlight is available at selected areas near the poles. We go to the Moon to learn how to extract and use those resources to create a space transportation system that can routinely access all of cislunar space with both machines and people. Such a goal makes our national space program relevant to national security and economic interests as well as to scientific ones. This return to the Moon is affordable under existing and projected budgetary constraints.

Creation of sustainable space access opens the Solar System to future generations. Having access to the Moon and the ability to use its resources is more important than how we go or how soon we get there. This architecture can relax schedule to fit any monetary or programmatic shortfall, as well as accelerate schedule if funding increases. But regardless of program pace, our goals and tactics remain the same; open the space frontier for a wide variety of purposes by harvesting the material and energy resources of the Moon. The decisions we make will determine if our long-delayed journey into the cosmos can begin.

## Lunar Base - Solvency – 1AC

Wide variety of support

Spudis MS in Planetary Geology PhD Geology & Lavoie NASA Marshall Space Flight Center 2010 Paul & Tony

“Mission and Implementation of an Affordable Lunar Return” Submitted to Space Manufacturing

http://www.spudislunarresources.com/Papers/Affordable\_Lunar\_Base.pdf

In the last two decades, an increasing variety of new sensors have explored the Moon from orbit and significantly changed our perception of its history, processes and composition. Our earlier understanding about the Moon as a volatile-poor object with a harsh and unforgiving surface environment came from studies of the Apollo samples and data. These samples are bone-dry; hydrogen found in returned lunar soil samples is present at a few parts per million concentration levels. Although we had tantalizing suggestions that water might be present near the permanently dark areas near the poles, previous data were inconclusive. In addition, we needed better images and topographic maps of the poles to fully understand their lighting conditions.

New data from a variety of missions have documented the nature and occurrence of water on the Moon (e.g., Spudis, 2006) and the unique lighting environment near the poles. Water is present in the polar areas in several different modes of occurrence. Thin layers of water molecules are widespread over the high latitudes; the Moon Mineralogy Mapper (M 3) documented the presence of water poleward of about 65° latitude (Pieters et al., 2009). Additionally, the impact of the LCROSS spacecraft in October 2009 kicked up a plume of dust, water vapor and ice particles; water is present in this locality at concentrations between 5 and 10 weight percent (Wooden et al., 2010). Finally, the Mini-SAR radar mapper on Chandrayaan-1 (Spudis et al., 2010) found dozens of craters at both poles that appear to contain nearly pure deposits of water ice; estimates for the north pole suggest up to 600 million cubic meters of water ice may occur within these craters (Figure 1). In total, the new results indicate the presence of pervasive and significant water ice at the poles of the Moon. For the purposes of this study, we assume a concentration of 10 wt.% water within our resource mining prospects. This is a very conservative estimate; our productivity and output will be commensurately higher with greater water concentrations.

### Solar and robotic reconnaissance

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In addition to the presence of water ice, new mapping data show areas of near-permanent sun illumination close the poles (Bussey et al., 2005; 2010). Some areas are illuminated more than 90% of the lunar year (Figure 1). Because darkness is primarily caused by local topography, eclipse periods occur at irregular intervals and have durations ranging from a few hours to almost 60 hours. For this study, we assume solar illumination for 80% of the lunar day, a conservative estimate that is valid for many areas near both poles. Periods of darkness are easily accommodated through temporary transition to power from batteries or rechargeable fuel cells. In addition to being suitable localities for solar arrays, these lit regions are also thermally more benign (surface temperatures on the order of -50° ± 10° C) than the equatorial regions, permitting extended operations for almost the entire 708-hour lunar day. At present, we do not know the optimum location for the lunar outpost based on the availability of water and illumination but existing data show several highly promising areas near the poles (e.g., Fig. 1). We conduct reconnaissance at both poles early in our program to answer these questions definitively. The polar regions contain resources of materials and energy that permit us to use the Moon as a logistics base for space faring within and beyond the Earth-Moon system.

## Lunar Base - Solvency – Robots 1st

### Moons proximity means robots can figure out all difficulties before humans get there

Spudis MS in Planetary Geology PhD Geology & Lavoie NASA Marshall Space Flight Center 2010 Paul & Tony

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The Moon is the closest planetary object to Earth and it contains the necessary material and energy resources to create new space faring capability. Its proximity to Earth is a key attribute: because round-trip light-time between Earth and Moon is only 3 seconds, we can control robotic machines on the lunar surface from Earth to accomplish a variety of tasks. This relation is crucial; it permits early and significant accomplishment on the Moon prior to human arrival. We use the proximity of the Moon to set up a functioning, productive lunar surface installation before the first human crew arrives. With constant availability of launch window and relatively low Δv requirements, our Moon is the most accessible extraterrestrial body. This accessibility adds significant flexibility to our operational plans, as we can send or retrieve assets to and from the Moon at any time.

### Robots 1st

Spudis MS in Planetary Geology PhD Geology 12/21/2010 Paul Air & Space Magazine Blog http://blogs.airspacemag.com/moon/2010/12/can-we-afford-to-return-to-the-moon/

The key to making all this work is the use of teleoperated robotic machines. We go to the Moon robotically first and later with people. These robots are controlled by people on the Earth. They prospect for resources, test techniques, evaluate product yields, set up processing plants, and begin harvesting lunar resources almost immediately. The extracted products are cached on the surface for future use. The entire lunar outpost is set-up and made operational by these robotic machines.

## Lunar Base Adv - Solvency – Incremental Key

Incremental nature of VSE is key

Spudis MS in Planetary Geology PhD Geology 12/21/2010 Paul Air & Space Magazine Blog http://blogs.airspacemag.com/moon/2010/12/can-we-afford-to-return-to-the-moon/

Our architecture is designed so that time is a free variable. We make constant, steady progress toward our goal; in fiscally lean times, we go slower, but we can accelerate the schedule if more money is available. Making individual steps small and incremental permits this approach – we are not waiting for the development or advent of some “magic carpet” piece of equipment to fill a major hole in our plan.

## Lunar Base Adv - Solvency – VSE Architecture

### VSE architecture solves

Spudis MS in Planetary Geology PhD Geology 12/21/2010 Paul Air & Space Magazine Blog http://blogs.airspacemag.com/moon/2010/12/can-we-afford-to-return-to-the-moon/

So what’s the bottom line? Our plan creates a fully functional, operating lunar resource outpost capable of manufacturing 150 metric tonnes of water per year. In addition, we develop a reusable space faring system, one fueled by lunar propellant and expandable to support missions to the planets and destinations throughout cislunar space. We do all of this under the budget guidelines provided to the Augustine committee by NASA; total aggregate funding for this program is less than $88 billion (real-year dollars), with peak funding of $7.1 B in Year 11. Although schedule is flexible, we achieve our primary mission goals by the end of year 16. We have had our assumptions, mass estimates and costing examined, reviewed and validated by a variety of space experts, including the Engineering Directorate Mission Analysis Group at NASA’s Marshall Space Flight Center. This program architecture does what Project Constellation did not: it returns America to the Moon with a legacy of real and permanent space faring infrastructure.

## Lunar Base Adv - Solvency – Moon Key

Moon key – resources and proximity

Spudis MS in Planetary Geology PhD Geology 12/21/2010 Paul Air & Space Magazine Blog http://blogs.airspacemag.com/moon/2010/12/can-we-afford-to-return-to-the-moon/

How do we accomplish all this? One of the principal advantages of the Moon as our first goal beyond LEO is that: 1) it has the material and energy resources we need; and 2) it is both close and accessible. This latter set of attributes is more important than you might think. The closeness of the Moon allows us to directly control and operate robots on the lunar surface; the time-lag between action on Earth and execution on the Moon is only a bit over one second. We can operate machines on the Moon in near real-time. Additionally, we can send space vehicles to the Moon at virtually any time. No other space destination is so easily and readily accessible.

## Lunar Base Adv - Solvency – AT: No Available Tech

Commercially available launch vehicles and existing shuttle hardware are sufficient to start the VSE

Spudis MS in Planetary Geology PhD Geology & Lavoie NASA Marshall Space Flight Center 2010 Paul & Tony

“Mission and Implementation of an Affordable Lunar Return” Submitted to Space Manufacturing

http://www.spudislunarresources.com/Papers/Affordable\_Lunar\_Base.pdf

At least three different studies examined the cost problems of the ESAS architecture and offered alternatives that cost less, take less development time, and are adequate for lunar surface return. One approach uses the commercially available Delta IV and Atlas V Evolved Expendable Launch Vehicles (EELV) and orbital propellant depots to perform lunar return (Zegler et al., 2009). This approach has the advantage of using existing launch vehicles but development of propellant depots is required to permit journeys beyond LEO. Two other approaches use existing Shuttle hardware to create new launch vehicles capable of launching lunar spacecraft in two or three pieces, which are then assembled in low Earth orbit for trips outward. Two concepts – DIRECT and Shuttle side-mount (SSM) – take advantage of the existing space industrial base, including tooling and assembly facilities, as well as the existing processing and launch infrastructure at Kennedy Space Center, to create new vehicles that can deliver tens of metric tonnes to LEO. The advantage of this approach is that we launch what is needed to go to the Moon complete and no depots are required; the disadvantage is that there is some new vehicle development needed. The use of existing Shuttle piece parts keeps this to a minimum.

We assume the use of multiple launch vehicles, using the best available assets to meet given payload and mission requirements, including EELV to launch early lunar surface robotic assets. A Delta IV Heavy and large Atlas V (551) can place 1-2 mT on the surface of the Moon. This is enough payload capacity to deliver significant capability to the Moon. We begin by conducting detailed robotic site exploration and characterization of the poles. We know enough to pick promising landing sites, however, strategic knowledge about the physical state, distribution, conditions and quantities of lunar volatiles must be gathered from surface lander and rover missions.

## Lunar Base Adv - Solvency – AT: HLVs

### HLV’s are not necessary for the first part of the VSE – once resource extraction is established it reduces the costs of HLV

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The development of a heavy-lift vehicle adds capability to our architecture but is not an absolute requirement for early missions, although we recognize that other strategic considerations (such as preservation of HLV infrastructure) may require the near-term development of such a vehicle. A Shuttle-derived vehicle has the least impact on existing facilities and the least amount of new development and thus, lower total cost. A single Shuttle side-mount (SSM) can launch about 70 mT to LEO and place 8-9 mT on the lunar surface. Two SSM launches can fly an entire human lunar mission; this is an important capability in the lunar return program. Once we have established a foothold on the Moon and have the capability to at least partly supply ourselves from lunar materials, the need for a very heavy lift vehicle lessens. In fact, the best time for the creation of propellant depots is after we are able to supply them with lunar propellant. Such an approach makes human planetary missions easier; the dead weight of propellant (at least 80% of the total mass of the spacecraft for a human Mars mission) need not come from the deep gravity well of Earth.

Much of the current debate about launch vehicles stems from the mission or objective of human flights beyond LEO. We believe that the fundamental objective of such flight is to extend human reach and presence from its current limitation in LEO to all levels of space beyond. To that end, we are agnostic on the need for any specific launch vehicle solution; our goal is to make complete dependence on such vehicles unnecessary as rapidly as possible through the use of offplanet resources. If a heavy lift vehicle is available early in the program, we will use it. If one is not, we will use other launch vehicles. Because we must scope the total effort within an assumed budget profile that would be available to NASA for any launch vehicle development as well as all mission hardware development, we developed an architecture that accomplishes the goal while fitting under the budget. We assume that a medium heavy lift launch vehicle (~70 mT) will be available during the later phases of our program (when humans are needed on the Moon.) Our particular architecture uses such a vehicle and reflects the cost of its development and operations, but other solutions are possible within the assumed budget wedge used by the Augustine Committee (2009).

# \*\*\*SPACE INDUSTRY ADV\*\*\*

## Space Industry Adv – 1AC

### Abandoning the VSE 🡺 uncertainty in our space program

Spudis MS in Planetary Geology PhD Geology 12/21/2010 Paul Air & Space Magazine Blog http://blogs.airspacemag.com/moon/2010/12/can-we-afford-to-return-to-the-moon/

I take issue with several points in the Augustine report and have commented on them at length in several previous posts of this blog. But now that the dust has settled and we have a “new direction” for our space program, its two principal deficiencies are evident. First, by discarding the clear strategic direction provided by the VSE, we have entered an era of uncertainty and aimlessness of purpose in our space program. This institutional drift is reflected in nearly daily stories about NASA – new missions studies, new launch vehicles, the endless personal backbiting amongst the space internet cognoscenti. Second, the assertion of the report that return to the Moon is “unaffordable” is simply wrong. How you go to the Moon and what your mission is there determines cost and all the committee looked at were cost models for the existing program and minor variants on it.

I have made both of these points here and elsewhere and many were quick to challenge me to show how we could go back to the Moon under the conditions and assumptions of the Augustine committee. Rather than shut up, I now put up. I have submitted a paper for publication in the Proceedings of Space Manufacturing 14, the conference in late October sponsored by the Space Studies Institute. My co-author Tony Lavoie and I have developed an architecture that returns America to the Moon with a specific mission in an affordable way. Our paper has now been accepted for publication, so I am posting a pre-print of it on my web site and will summarize our findings here.

One of the biggest problems with NASA’s implementation of the VSE was that they never understood why we were going to the Moon. I base this assertion on their own statements, actions and publications. Early workshops were held by the agency to develop a rationale for lunar return. The Exploration Directorate issued a poster showing six “themes” for lunar return, but no one at the agency could state their mission in one sentence. At a Congressional hearing in 2009, the acting administrator of NASA said the he did not understand what “return to the Moon” meant in terms of mission objectives and activities.

The agency took the position that they were merely transportation agents – that it was up to the various “user” communities to decide that activities were to be undertaken on the Moon. As a matter of fact, the Vision itself very specifically laid out what was to be done on the Moon and even how to approach it. The purpose of lunar return is to learn the skills and develop the technologies we need to live on another world. The Vision specifically mentions that one skill we need to acquire is the use of extraterrestrial resources to make both exploration and human presence permanent and sustainable.

Uncertainty kills the space industry

Maser Chair of the Corporate Membership Committee – American Institute of Aeronautics and Astronautics and President – Pratt & Whitney Rocketdyne, 2011 Jim, “A Review of NASA’s Exploration Program in Transition: Issues for Congress and Industry”, U.S. House Science, Space, and Technology Committee Hearing, 3-30, http://www.prattwhitney.com/media\_center/executive\_speeches/jim\_maser\_03-30-2011.asp

This lack of a unified strategy coupled with the fact that the NASA transition is being planned without any coordination with industry leaders, makes it impossible for businesses like mine to adequately plan for the future.

How can we right-size our businesses and work towards achieving greatest efficiency if we can’t define the future need? This is an impossible task.

So, faced with this uncertainty, companies like mine continue fulfilling Constellation requirements pursuant to the Congressional mandate to capitalize on our investment in this program, but we are doing so at significantly reduced contractual baseline levels, forcing reductions in force at both the prime contractor and subcontractor levels.

This reality reflects the fact that the space industrial base is not FACING a crisis; we are IN a crisis.

And we are losing a National Perishable Asset ... our unique workforce.

The entire space industrial base is currently being downsized with no net gain of jobs. At the same time we are

totally unclear as to what might be the correct levels needed to support the government.

Designing, developing, testing, and manufacturing the hardware and software to explore space requires highly skilled people with unique knowledge and technical expertise which takes decades to develop.

These technical experts cannot be grown overnight, and once they leave the industry, they rarely return. If the U.S. develops a tremendous vision for space exploration five years from now, but the people with these critical skills have not been preserved and developed, that vision will disappear.

We need that vision, that commitment, that certainty right now, not five or ten years from now, if we are going to have a credible chance of bringing it to fruition.

In addition to difficulties in retaining our current workforce, the uncertainty facing the U.S. space program is already having a negative impact on our industry’s ability to attract new talent from critical science, technology, engineering and mathematics. Young graduates who may have been inspired to follow STEM education plans because of their interest in space and space exploration look at the industry now and see no clear future. This will have implications on the space industrial base for years to come.

## Space Industry Adv – 1AC

### Spills over to destroy air power

Thompson President – American Institute of Aeronautics and Astronautics 2009 David, , “The Aerospace Workforce”, Federal News Service, 12-10, Lexis

Aerospace systems are of considerable importance to U.S. national security, economic prosperity, technological vitality, and global leadership. Aeronautical and space systems protect our citizens, armed forces, and allies abroad. They connect the farthest corners of the world with safe and efficient air transportation and satellite communications, and they monitor the Earth, explore the solar system, and study the wider universe. The U.S. aerospace sector also contributes in major ways to America's economic output and high- technology employment. Aerospace research and development and manufacturing companies generated approximately $240 billion in sales in 2008, or nearly 1.75 percent of our country's gross national product. They currently employ about 650,000 people throughout our country. U.S. government agencies and departments engaged in aerospace research and operations add another 125,000 employees to the sector's workforce, bringing the total to over 775,000 people. Included in this number are more than 200,000 engineers and scientists -- one of the largest concentrations of technical brainpower on Earth. However, the U.S. aerospace workforce is now facing the most serious demographic challenge in his 100-year history. Simply put, today, many more older, experienced professionals are retiring from or otherwise leaving our industrial and governmental aerospace workforce than early career professionals are entering it. This imbalance is expected to become even more severe over the next five years as the final members of the Apollo-era generation of engineers and scientists complete 40- or 45-year careers and transition to well-deserved retirements. In fact, around 50 percent of the current aerospace workforce will be eligible for retirement within just the next five years. Meanwhile, the supply of younger aerospace engineers and scientists entering the industry is woefully insufficient to replace the mounting wave of retirements and other departures that we see in the near future. In part, this is the result of broader technical career trends as engineering and science graduates from our country's universities continue a multi-decade decline, even as the demand for their knowledge and skills in aerospace and other industries keeps increasing. Today, only about 15 percent of U.S. students earn their first college degree in engineering or science, well behind the 40 or 50 percent levels seen in many European and Asian countries. Due to the dual-use nature of aerospace technology and the limited supply of visas available to highly-qualified non-U.S. citizens, our industry's ability to hire the best and brightest graduates from overseas is also severely constrained. As a result, unless effective action is taken to reverse current trends, the U.S. aerospace sector is expected to experience a dramatic decrease in its technical workforce over the next decade. Your second question concerns the implications of a cutback in human spaceflight programs. AIAA's view on this is as follows. While U.S. human spaceflight programs directly employ somewhat less than 10 percent of our country's aerospace workers, its influence on attracting and motivating tomorrow's aerospace professionals is much greater than its immediate employment contribution. For nearly 50 years the excitement and challenge of human spaceflight have been tremendously important factors in the decisions of generations of young people to prepare for and to pursue careers in the aerospace sector. This remains true today, as indicated by hundreds of testimonies AIAA members have recorded over the past two years, a few of which I'll show in brief video interviews at the end of my statement. Further evidence of the catalytic role of human space missions is found in a recent study conducted earlier this year by MIT which found that 40 percent of current aerospace engineering undergraduates cited human space programs as the main reason they chose this field of study. Therefore, I think it can be predicted with high confidence that a major cutback in U.S. human space programs would be substantially detrimental to the future of the aerospace workforce. Such a cutback would put even greater stress on an already weakened strategic sector of our domestic high-technology workforce. Your final question centers on other issues that should be considered as decisions are made on the funding and direction for NASA, particularly in the human spaceflight area. In conclusion, AIAA offers the following suggestions in this regard. Beyond the previously noted critical influence on the future supply of aerospace professionals, administration and congressional leaders should also consider the collateral damage to the space industrial base if human space programs were substantially curtailed. Due to low annual production rates and highly-specialized product requirements, the domestic supply chain for space systems is relatively fragile. Many second- and third-tier suppliers in particular operate at marginal volumes today, so even a small reduction in their business could force some critical suppliers to exit this sector. Human space programs represent around 20 percent of the $47 billion in total U.S. space and missile systems sales from 2008. Accordingly, a major cutback in human space spending could have large and highly adverse ripple effects throughout commercial, defense, and scientific space programs as well, potentially triggering a series of disruptive changes in the common industrial supply base that our entire space sector relies on.

## Space Industry Adv – 1AC

### US airpower is key to deter WMD conflict

Tellis Senior Political Scientist – RAND 1998 Ashley, “Sources of Conflict in the 21st Century”, http://www.rand. org/publications/MR/MR897/MR897.chap3.pdf

This subsection attempts to synthesize some of the key operational implications distilled from the analyses relating to the rise of Asia and the potential for conflict in each of its constituent regions. The first key implication derived from the analysis of trends in Asia suggests that American air and space power will continue to remain critical for conventional and unconventional deterrence in Asia. This argument is justified by the fact that several subregions of the continent still harbor the potential for full-scale conventional war. This potential is most conspicuous on the Korean peninsula and, to a lesser degree, in South Asia, the Persian Gulf, and the South China Sea. In some of these areas, such as Korea and the Persian Gulf, the United States has clear treaty obligations and, therefore, has preplanned the use of air power should contingencies arise. U.S. Air Force assets could also be called upon for operations in some of these other areas. In almost all these cases, U.S. air power would be at the forefront of an American politico-military response because (a) of the vast distances on the Asian continent; (b) the diverse range of operational platforms available to the U.S. Air Force, a capability unmatched by any other country or service; (c) the possible unavailability of naval assets in close proximity, particularly in the context of surprise contingencies; and (d) the heavy payload that can be carried by U.S. Air Force platforms. These platforms can exploit speed, reach, and high operating tempos to sustain continual operations until the political objectives are secured. The entire range of warfighting capability—fighters, bombers, electronic warfare (EW), suppression of enemy air defense (SEAD), combat support platforms such as AWACS and J-STARS, and tankers—are relevant in the Asia-Pacific region, because many of the regional contingencies will involve armed operations against large, fairly modern, conventional forces, most of which are built around large land armies, as is the case in Korea, China-Taiwan, India-Pakistan, and the Persian Gulf. In addition to conventional combat, the demands of unconventional deterrence will increasingly confront the U.S. Air Force in Asia. The Korean peninsula, China, and the Indian subcontinent are already arenas of WMD proliferation. While emergent nuclear capabilities continue to receive the most public attention, chemical and biological warfare threats will progressively become future problems. The delivery systems in the region are increasing in range and diversity. China already targets the continental United States with ballistic missiles. North Korea can threaten northeast Asia with existing Scud-class theater ballistic missiles. India will acquire the capability to produce ICBM-class delivery vehicles, and both China and India will acquire long-range cruise missiles during the time frames examined in this report.

## Space Industry Adv – Internal Link

Uncertainty internal link to Space industry

Maser Chair of the Corporate Membership Committee – American Institute of Aeronautics and Astronautics and President – Pratt & Whitney Rocketdyne, 2011 Jim, “A Review of NASA’s Exploration Program in Transition: Issues for Congress and Industry”, U.S. House Science, Space, and Technology Committee Hearing, 3-30, http://www.prattwhitney.com/media\_center/executive\_speeches/jim\_maser\_03-30-2011.asp

Access to space plays a significant part in the Department of Defense’s ability to secure our nation. The lack of a unified national strategy brings uncertainty in volume, meaning that fixed costs will go up in the short term across all customers until actual demand levels are understood. Furthermore, the lack of space policy will have ripple effects in the defense budget and elsewhere, raising costs when it is in everyone’s interests to contain costs.

Now, it is of course true that there are uncertainties about the best way to move forward. This was true in the early days of space exploration and in the Apollo and Shuttle eras.

Unfortunately, we do not have the luxury of waiting until we have all the answers. We must not “let the best be the enemy of the good.” In other words, selecting a configuration that we are absolutely certain is the optimum configuration is not as important as expeditiously selecting one of the many workable configurations, so that we can move forward.

This industry has smart people with excellent judgment, and we will figure the details out, but not if we don’t get moving soon. NASA must initiate SLS and MPCV efforts without gapping the program efforts already in place intended to support Constellation.

The time for industry and government to work together to define future space policy is now. We must establish an overarching policy that recognizes the synergy among all government space launch customers to determine the right sustainable industry size, and plan on funding it accordingly.

The need to move with clear velocity is imperative if we are to sustain our endangered U.S. space industrial base, to protect our national security, and to retain our position as the world leader in human spaceflight and space exploration. I believe that if we work together we can achieve these goals.

## Space Industry Adv – Solvency

### Clear directive is key to space industry– why is more important then how – VSE solves

Spudis MS in Planetary Geology PhD Geology 5/24/2011 Paul Air & Space Magazine Blog http://blogs.airspacemag.com/moon/2011/05/presidential-pronouncements-on-space-some-50th-anniversary-thoughts/

The problem with applying Logsdon’s reasoning to the current U.S. space policy morass is that, as with our endless debate about heavy lift vs. other launch vehicle options, it confuses means with ends. Whether we go into space with or without a bold presidential declaration is secondary to WHY we are doing it. Because we have not stated what we are trying to achieve, arguments about how we go about it, whether in terms of rockets, destinations, declarations or participants, leave us still sitting on the launch pad (soon, only on a Russian launch pad). Without an agreed upon national purpose, space has become a political toy, vulnerable to changes in direction with each new administration.

On the 50th anniversary of Kennedy’s rightly famous speech, the real question before us remains unaddressed and in some respects, unasked. I ask it now: What are we trying to accomplish with our national civil space program? By answering that question and establishing a realistic and reachable national goal, America will establish a lasting space industry and presence, one undeterred or hobbled by changing political winds.

I have my own answer to this question, which I have discussed here and elsewhere in detail. Space development is an essential, irreplaceable part of everyday life in 21st Century America; we have charted a course whereby we must learn the skills of creating more capability in space, including the building and maintenance of larger, more capable space assets (as well as protecting existing ones). To proceed, we need a reusable and extensible Earth-Moon space transportation system. I believe that one can be created through the production and use of the material and energy resources of the Moon.

Such a transportation system will extend human reach into the Solar System beyond low Earth orbit. By demonstrating the viability of resource extraction off planet, individual and joint investments will materialize in many forms and from many sectors, spurring on a new and burgeoning space industry. This template contrasts significantly with an elitist, academic exercise in scientific data collection wrapped in the worn out mantra of “exciting” the public. Our national interests will be best served through cislunar development and space resource utilization.

If these are desirable goals, then how we go about achieving it can be the subject of legitimate debate. Until we address the objective of a large-scale national expenditure for space, presidential announcements will never possess the power or the effect Kennedy’s words had in bringing about a great era of American productivity and pride. The United States is at a critical crossroads. Will we lead or will we be content to follow?

## Paul Spudis – Extended Qualifications

### Paul Spudis – extended qualifications

Space Review 2007 http://www.thespacereview.com/article/791/1

Paul D. Spudis is a planetary scientist at the Applied Physics Laboratory in Laurel, Maryland. He was a member of the Clementine Science Team in 1994. In 2004, was a member of the President’s Commission on the Implementation of US Space Exploration Policy and was presented with the NASA Distinguished Public Service Medal for that work. He is the recipient of the 2006 Von Karman Lectureship in Astronautics, awarded by the American Institute for Aeronautics and Astronautics. He is the author or co-author of over 150 scientific papers and four books, including The Once and Future Moon, a book for the general public in the Smithsonian Library of the Solar System series; The Clementine Atlas of the Moon (with Ben Bussey), published in 2005 by Cambridge University Press; and Moonwake: The Lunar Frontier (with Anne Spudis), an adventure novel for young adults about life at a base on the Moon. His web site can be found at http://www.spudislunarresources.com