# NASA Trade-off Das

NASA Trade-off Das 1

1NC Earth Sciences DA 3

1NC Aeronautics DA 6

\*\*\*General Link Work 10

2NC Link Wall 11

Yes Tradeoff 14

Yes Tradeoff – Budget Freeze Now 16

Yes Tradeoff – Congress 17

Yes Tradeoff- Human capital 18

Yes Tradeoff- independent missions 19

Link- General (Moon/Mars Exploration) 20

Link- Exploration (General) 22

Link- Constellation (Earth Science) 24

Link- Colonization 25

Link- Moon 26

Link- SBSP 28

Link- Mars 29

Link- Space Debris 31

Link- Space Weapons 33

NASA does the plan- General 34

NASA does the plan- Moon 36

\*\*\*Earth Sciences 38

Uniqueness 39

Turns the Case 40

Ext- trades off with Earth Sciences 41

Ext- Solves Climate 42

Disease Scenario Impact Shell 45

Ext- Solves Disease 47

Disease Impact 49

Solves Conflict 50

\*\*\*Aeronautics Scenario 52

2NC turns the case 53

Uniqueness Ext 54

Trades off with Aeronautics 55

NASA key to Aeronautics- general 56

Colonization Link 57

I/L Aerospace industry key to Econ 58

AT: Aerospace’s Retiring Workforce 60

Cyber War Impact 61

Terrorism Impact 63

Heg Impact 67

Democracy Impact 69

Disaster Relief & Humanitarian Aid 70

Prolif Impact 71

Drug Trafficking Impact 72

Deterrence Impact 73

NASA key to green aviation 76

ISS Link- Idea for future 78

Aff Answers 80

N/U- Cuts now 81

N/U- NASA doing other stuff already 82

N/U- Cost overruns now 83

NASA doesn’t do satellites, space tourism, or space manufacturing 84

NASA’s Climate Monitoring Fails 85

Climate Monitoring is doomed in the future 86

## 1NC Earth Sciences DA

### Unique link- Congress will force an internal tradeoff for new NASA spending

Svitak, 3/29 [Amy Svitak; Senior Writer – Space.com, “NASA’s Budget Could Get Infusion From Other U.S. Departments,” March 29, 2011, <http://www.space.com/11247-nasa-budget-funding-commerce-justice-departments.html>, DA 7/24/11]//RS

Congressional appropriators could tap the funding accounts of the U.S. departments of Commerce and Justice to help cover what some see as a $1 billion shortfall in NASA’s $18.7 billion spending plan for 2012, which allocates less money for a heavy-lift rocket and crew capsule than Congress directed last year. “There’s over a billion-dollar difference between the budget request and the authorized levels in [20]12 for the launch system and the crew vehicle, and now that falls squarely back on the shoulders of [the appropriations committees] to try and figure out where to come up with that money,” said a panelist at a March 23 breakfast on Capitol Hill. Sponsored by Women in Aerospace (WIA), the breakfast was held under the Chatham House Rule, an 84-year-old protocol fashioned by the London-based nonprofit think-tank to promote frank discussion through anonymity. [What Obama and Congress Should Do for Spaceflight] The panelist, one of six whose names and job titles were circulated by WIA prior to the meeting, said funding requested in NASA’s 2012 spending plan does not square with levels Congress set in the NASA Authorization Act of 2010 that U.S. President Barack Obama signed into law in October. Specifically, the request called for spending $1.2 billion less than the $4 billion Congress authorized for the heavy-lift launch vehicle and crew capsule in 2012. At the same time, the request includes $350 million more than the $500 million Congress authorized to nurture development of commercial vehicles to deliver cargo and crews to the International Space Station after the space shuttle retires later this year. Consequently, the panelist said, it is now up to congressional appropriators “to find a billion dollars in other places in NASA to pay for those activities or to decide to make those tradeoffs and take that money out of the departments of Commerce or Justice or the other agencies that are funded in the same bill as NASA.” NASA’s annual appropriation is part of a broader spending package totaling nearly $65 billion that funds the U.S. Commerce and Justice departments, the National Science Foundation, the National Institute of Standards and Technology and related agencies. But with NASA and other federal agencies operating in a fiscally constrained environment, the panelist said Congress could struggle to fund new multibillion-dollar programs next year. “It’s not impossible but the ability to do that is severely constrained in the environment we’re working in now, and that’s exacerbated by budget requests coming up from the administration that don’t track with the authorization,” the panelist said. Congress has yet to pass an appropriations bill for 2011, leaving NASA and most federal agencies to subsist at 2010 spending levels in the current budget year. The panelist said passing spending legislation for NASA “is a complicated and challenging thing this year, and it will be again next year” given a fiscal climate that has changed dramatically authorized funding levels for the space agency were set last fall. However, the panelist said the appropriations subcommittees that fund NASA are “very supportive of the agency, they’re supportive of the authorization, they want to see NASA get as close as possible to those authorized levels, so that will be a work in progress.”

### Funding for Earth Observation will go to manned space exploration

Lewis, Ladislaw, and Zheng 10 [Lewis - senior fellow and director of the Technology and Public Policy Program at CSIS. Sarah O. - senior fellow in the Energy and National Security Program at CSIS Denise E. Zheng , June 2010, “ Earth Observation for Climate Change,” <http://csis.org/files/publication/100608_Lewis_EarthObservation_WEB.pdf>]

Climate change poses a dilemma for space policy. The programs needed to manage climate change have been woefully underfunded for decades. The normal practice is to call uncritically for more money for civil space and its three components—planetary exploration, Earth observation, and manned spaceflight. In fact, civil space has been lavishly funded. Since 1989, NASA has received $385 billion, with $189 billion in the last decade. 3 This is more than the space budgets of most other nations combined. The problem is not a lack of money but how it has been spent. **The bulk of this money went to NASA’s manned space program.** This is a legacy of the Cold War. Manned spaceflight showed that market democracies could surpass scientific socialism. The point has been made. Spaceflight provides prestige, but a long series of miscalculations have left the United States with a fragile and fabulously expensive space transportation system. It will take years to recover, and some goals, such as a voyage to Mars, are simply unachievable absent major breakthroughs in physics and other sciences**. If we accept that climate change poses serious risks to regional stability, national security, and economic health, the United States needs to reconsider its funding priorities for civil space**. Earth observation is crucial for national security and the economy; manned spaceflight programs provide prestige. The United States must make climate-monitoring satellites its priority for funding if it is serious about managing climate change. In practical terms, this means **a reduction in the spending on human spaceflight in order to fund a sustained program of satellite-building to create a robust climate monitoring space system.**This is, of course, not an all-or-nothing issue. The United States can fund a range of space programs, manned and unmanned, for exploration and for Earth sciences. It is a question of priorities. Our recommendation is that the funding given to Earth observation should increase, as it is more important now for the national interest to monitor and manage climate change, even if that means a slower pace for other programs, such as manned spaceflight, until a robust Earth observation system has been put in orbit

### NASA is key to keeping global warming in check

Lewis, Ladislaw, and Zheng 10 [Lewis - senior fellow and director of the Technology and Public Policy Program at CSIS. Sarah O. - senior fellow in the Energy and National Security Program at CSIS Denise E. Zheng , June 2010, “ Earth Observation for Climate Change,” <http://csis.org/files/publication/100608_Lewis_EarthObservation_WEB.pdf>]

Until this year, America’s civil space policies—and the budgets that derive from it—were shaped to a considerable degree by the political imperatives of the past and by the romantic fiction of spaceflight. We believe there is a new imperative—climate change—that should take precedence in our national plans for space and that the goal for space spending in the next decade should be to create a robust and adequate Earth observation architecture**. There is unequivocal evidence, despite careless mistakes and noisy protests, that Earth’s climate is warming**. While the effects and implications of this are subject to speculation, there should be no doubt that the world faces a major challenge. There are important shortfalls in data and analysis needed to manage this challenge. Inadequate data mean that we cannot determine the scope or nature of change in some key areas, such as the melting of Antarctic sea ice. Long-term changes in daily temperature are not adequately understood, in part because of limited observations of atmospheric changes. Our understanding of how some anthropogenic (man-made) influences affect climate change is still incomplete. 1 These shortfalls must be remedied, if only to overcome skepticism and doubt. Climate change now occupies a central place on the global political agenda, and the United States should adjust its space policies to reflect this. Assessing and managing climate change will require taking what has largely been a scientific enterprise and “operationalizing” it. Operationalization means creating processes to provide the data and analysis that governments will need if they are to implement policies and regulations to soften the effects of climate change. Operationalization requires the right kind of data and adequate tools for collecting, analyzing, and disseminating that data in ways that inform decisionmaking at many levels of society**. Satellites play a central role in assessing climate change because they can provide a consistent global view, important data, and an understanding of change in important but remote areas**. Yet there are relatively few climate satellites—a total of 19, many of which are well past their expected service life. Accidents or failures would expose the fragility of the Earth observation system. 2 We lack the required sensors and instruments for the kinds of measurement that would make predictions more accurate and solutions more acceptable. Weather satellites, which take low-resolution pictures of clouds, forests, and ice caps, are not adequate to the task. **NASA builds impressive Earth observation satellites for climate change**, but these have been experimental rather than ongoing programs.

### Warming leads to extinction – try or die

Romm 10 (Jon, Editor of Climate Progress, “Disputing the “consensus” on global warming,” http://climateprogress.org/2010/06/16/scientific-consensus-on-global-warming-climate-science/, JG)

A good example of how scientific evidence drives our understanding concerns how we know that humans are the dominant cause of global warming. This is, of course, the deniers’ favorite topic. Since it is increasingly obvious that the climate is changing and the planet is warming, the remaining deniers have coalesced to defend their Alamo — that human emissions aren’t the cause of recent climate change and therefore that reducing those emissions is pointless. Last year, longtime Nation columnist Alexander Cockburn wrote, “There is still zero empirical evidence that anthropogenic production of CO2 is making any measurable contribution to the world’s present warming trend. The greenhouse fearmongers rely entirely on unverified, crudely oversimplified computer models to finger mankind’s sinful contribution.” In fact, the evidence is amazingly strong. Moreover, if the relatively complex climate models are oversimplified in any respect, it is by omitting amplifying feedbacks and other factors that suggest human-caused climate change will be worse than is widely realized. The IPCC concluded last year: “Greenhouse gas forcing has very likely (>90 percent) caused most of the observed global warming over the last 50 years. This conclusion takes into account … the possibility that the response to solar forcing could be underestimated by climate models.” Scientists have come to understand that “forcings” (natural and human-made) explain most of the changes in our climate and temperature both in recent decades and over the past millions of years. The primary human-made forcings are the heat-trapping greenhouse gases we generate, particularly carbon dioxide from burning coal, oil and natural gas. The natural forcings include fluctuations in the intensity of sunlight (which can increase or decrease warming), and major volcanoes that inject huge volumes of gases and aerosol particles into the stratosphere (which tend to block sunlight and cause cooling)…. Over and over again, scientists have demonstrated that observed changes in the climate in recent decades can only be explained by taking into account the observed combination of human and natural forcings. Natural forcings alone just don’t explain what is happening to this planet. For instance, in April 2005, one of the nation’s top climate scientists, NASA’s James Hansen, led a team of scientists that made “precise measurements of increasing ocean heat content over the past 10 years,” which revealed that the Earth is absorbing far more heat than it is emitting to space, confirming what earlier computer models had shown about warming. Hansen called this energy imbalance the “smoking gun” of climate change, and said, “There can no longer be genuine doubt that human-made gases are the dominant cause of observed warming.” Another 2005 study, led by the Scripps Institution of Oceanography, compared actual ocean temperature data from the surface down to hundreds of meters (in the Atlantic, Pacific and Indian oceans) with climate models and concluded: A warming signal has penetrated into the world’s oceans over the past 40 years. The signal is complex, with a vertical structure that varies widely by ocean; it cannot be explained by natural internal climate variability or solar and volcanic forcing, but is well simulated by two anthropogenically [human-caused] forced climate models. We conclude that it is of human origin, a conclusion robust to observational sampling and model differences. Such studies are also done for many other observations: land-based temperature rise, atmospheric temperature rise, sea level rise, arctic ice melt, inland glacier melt, Greeland and Antarctic ice sheet melt, expansion of the tropics (desertification) and changes in precipitation. Studies compare every testable prediction from climate change theory and models (and suggested by paleoclimate research) to actual observations. How many studies? Well, the IPCC’s definitive treatment of the subject, “Understanding and Attributing Climate Change,” has 11 full pages of references, some 500 peer-reviewed studies. This is not a consensus of opinion. It is what scientific research and actual observations reveal. And the science behind human attribution has gotten much stronger in the past 2 years (see a recent literature review by the Met Office here). That brings us to another problem with the word “consensus.” It can mean “unanimity” or “the judgment arrived at by most of those concerned.” Many, if not most, people hear the second meaning: “consensus” as majority opinion. The scientific consensus most people are familiar with is the IPCC’s “Summary for Policymakers” reports. But those aren’t a majority opinion. Government representatives participate in a line-by-line review and revision of these summaries. So China, Saudi Arabia and that hotbed of denialism — the Bush administration — get to veto anything they don’t like. The deniers call this “politicized science,” suggesting the process turns the IPCC summaries into some sort of unscientific exaggeration. In fact, the reverse is true. The net result is unanimous agreement on a conservative or watered-down document. You could argue that rather than majority rules, this is “minority rules.” Last April, in an article titled “Conservative Climate,” Scientific American noted that objections by Saudi Arabia and China led the IPCC to remove a sentence stating that the impact of human greenhouse gas emissions on the Earth’s recent warming is five times greater than that of the sun. In fact, lead author Piers Forster of the University of Leeds in England said, “The difference is really a factor of 10.” Then I discuss the evidence we had even back in 2008 that the IPCC was underestimating key climate impacts, a point I update here. The bottom line is that recent observations and research make clear the planet almost certainly faces a greater and more imminent threat than is laid out in the IPCC reports. That’s why climate scientists are so desperate. That’s why they keep begging for immediate action. And that’s why the “consensus on global warming” is a phrase that should be forever retired from the climate debate. The leading scientific organizations in this country and around the world, including all the major national academies of science, aren’t buying into some sort of consensus of opinion. They have analyzed the science and observations and expressed their understanding of climate science and the likely impacts we face on our current emissions path — an understanding that has grown increasingly dire in recent years (see “An illustrated guide to the latest climate science” and “An introduction to global warming impacts: Hell and High Water“).

## 1NC Aeronautics DA

### NASA is shifting space shuttle funds to technology programs like aeronautics- not towards exploration.

Kelly 7-3-11 (John, has spent eight years covering the space industry for FLORIDA TODAY, Budget will focus on new technology, http://www.floridatoday.com/article/20110703/COLUMNISTS0405/107030311/John-Kelly-Budget-will-focus-new-technology)

NASA presentations, presidential statements and more than one blue-ribbon commission pointed out that since the nation couldn't afford to infuse billions more into the space program, the only way to shift money to the next phase of human space exploration was to stop spending money on the shuttle. Now that we're about to enter that phase, it seemed a good time to take a closer look at the space agency's budget to see if, in fact, the money that won't be spent on the space shuttle in 2012 and 2013 will be dedicated to the future of human space exploration. The answer: Not quite. Certainly, not all of it. In 2010, the last full year of shuttle flights, NASA spent $3.1 billion operating the fleet. Next year, the first full year with no shuttles flying, the agency plans to spend about $665 million, including costs such as preparing the orbiters for museums and buttoning up launch facilities. Costs all but vanish by 2013. NASA's overall budget, however, is the same in 2012 as the space agency spent in 2010. A few key line items represent most of the big increases that offset the plummeting space shuttle budget. They include items related to the future of human space exploration and some that are questionable. I'll list them here and let you decide: $811 million on commercial crew transportation. That's the seed money the government is feeding into an effort to get private companies to develop space "taxis" to carry astronauts to and from the International Space Station, a necessity for continued operations of the outpost. NASA contends that is an investment in the future of human space exploration because of science and engineering work necessary to better understand long-duration spaceflight. $774 million on space technology. Most of that money would go to development of new technologies needed to overcome some of the most pressing obstacles to longer flights deeper into the solar system: human exposure to radiation, revolutionary propulsion and in-space fuel depots for instance. $529 million more on day-to-day operation of the International Space Station, an amount that will continue to rise each year in the long-term plan. $519 million more on robotic spacecraft, the majority for a major boost in satellites aimed at studying the Earth -- primarily climate change. Another $1 billion or more spread around the budgets for space telescopes and probes, aeronautics research, education and other programs.

### The plan directly trades off with NASA’s aeronautics activities- both funding and research focus- tanking US aviation leadership.

Watkins et al 06 (Todd, PhD-Harvard and director-Lehigh University’s Institute for Entrepreneurship, Creativity and Innovation, with ALAN SCHRIESHEIM and STEPHEN MERRILL, Glide Path to Irrelevance: Federal Funding for Aeronautics, http://www.issues.org/23.1/watkins.html)

Aeronautics within NASA is too important to neglect in favor of space. But that is just what the federal government is doing. The nation’s 100-year preeminence in aviation is in serious jeopardy. So, too, are the medium- and long-term health and safety of the U.S. air transportation system. The peril stems from a lack of national consensus about the federal government’s role in civilian aviation generally and about the National Aeronautics and Space Administration’s (NASA’s) role in aviation technology development in particular. Aeronautics—the first “A” in NASA—is now vastly overshadowed in resources, managerial attention, and political support by the agency’s principal mission of space exploration and discovery. Indeed, most people have no idea that NASA is the leading, and essentially the only, agency that is organizationally and technically capable of supporting the nation’s leadership in air transportation, air safety, and aircraft manufacturing. The aeronautics community supports an expansive public R&D program, with NASA playing a lead role. But during the past seven or eight years, successive administrations and Congresses have reduced NASA’s aeronautics budget without articulating how the program should be scaled back. In these circumstances, NASA has tried to maintain a sprawling program by spreading diminishing resources across existing research establishments and many objectives and projects—too many to ensure their effectiveness and the application of their results. With its plans to return humans to the Moon and eventually send them to Mars, the Bush administration has added to the problem by further reducing the aeronautics budget. The budget request for fiscal year (FY) 2006 and succeeding years anticipates a 50% reduction in NASA’s aeronautics R&D spending and personnel by 2010. The current NASA management understands that such resources will not support an expansive program and proposes to refocus efforts on fundamental research, avoiding costly demonstration projects. That may appear to be a reasonable strategy given the current outlook for funding, but it risks losing the support of industry stakeholders and other intended users of NASA-developed technologies. They operate in a risk-averse environment and often depend on outside suppliers to deliver well-proven technologies. This is especially the case in public goods research, such as safe, efficient air-traffic management and environmentally benign aviation operations, in which the argument for NASA involvement is strongest. Thus, with either its previous peanut-butter-spreading approach or its current fundamental research focus, we believe that the agency is on a glide path progressively leading to the irrelevance of the first A in NASA. The administration’s 2006 budget proposal exposed the lack of agreement between the government and the aeronautics community about the federal government’s role in aeronautics. NASA’s former associate administrator, Victor Lebacqz, acknowledged as much in defending the president’s budget request before the House Science Committee. He said that there currently are two contending points of view. One point of view, reflected in a host of remarkably consistent blue-ribbon commissions and national panel reports, is that the aviation sector is critically important to national welfare and merits government support to ensure future economic growth and national competitiveness. This view implies an expansive public and private R&D program. The other view, reflected in the administration’s budget submission, is that the aviation industry is approaching maturity, with aviation becoming something of a commodity, and that the government can therefore retrench and leave technology development to the private sector. Lebacqz neglected to mention what in our view is the most compelling case for reinvigorating national investment in aerospace technologies: clear public-good objectives— mobility, safety, and environmental protection—served by NASA’s R&D involvement. At any rate, the proposed retrenchment had a galvanizing effect. Congress rejected the proposed cut and restored NASA’s Aeronautics Research Mission Directorate (ARMD) budget. At the same time, Congress passed the NASA Authorization Act, which called on the administration to prepare a policy statement on aeronautics as a basis for further discussion with Congress. A new NASA administrator and associate administrator withdrew proposed plans to scale back support for aeronautics and set to work on a new plan for ARMD. These were encouraging signs that a potentially fatal retrenchment could be avoided. But in his FY 2007 budget proposals for NASA, the president proposed a further 18% cut in aeronautics, to $724 million. This is in comparison to the $16.8 billion total NASA request, mostly targeted on space. If enacted, the resulting aeronautics budget in real terms would be less than one-half what it was in 1994. Thus, it is long past time for a sustained high-profile national dialogue about the public value of national investments in aeronautics, distinct from space, and the very real continuing threat to NASA’s unique role and capabilities in aeronautics.

### US aerospace leadership is critical to US air power.

Watkins et al 06 (Todd, PhD-Harvard and director-Lehigh University’s Institute for Entrepreneurship, Creativity and Innovation, with ALAN SCHRIESHEIM and STEPHEN MERRILL, Glide Path to Irrelevance: Federal Funding for Aeronautics, http://www.issues.org/23.1/watkins.html)

World leadership in air transportation and aircraft manufacturing is widely viewed as a cornerstone of U.S. economic welfare and national security. Department of Transportation statistics are revealing. U.S. residents already have the highest per capita level of air travel in the world, and use is rising steadily. Domestic commercial flights, the backbone of the U.S. travel industry, carried 660 million passengers in 2005. The Federal Aviation Administration predicts one billion passengers by 2015. General aviation already flies 150 million more passengers than do commercial flights. Air cargo has grown 7% annually since 1980, by far the fastest-growing mode of freight transportation during the past two decades. It now accounts for more than one-quarter of the overall value of U.S. international merchandise trade, steadily gaining ground on the maritime sector, which has a two-fifths share. JFK International Airport alone handled $125 billion worth of international air cargo in 2004; this total ranks ahead of the value of cargo through the Port of Los Angeles, the nation’s leading maritime port. Aviation’s national economic impact does not stop with the air transport system. Aerospace exports in 2005 made up nearly 30% of all U.S. exports in the category that the Department of Commerce labels “advanced technology products.” Census Bureau trade figures indicate that aerospace, mainly airplanes and parts, delivered a surplus to the United States of nearly $37 billion in 2005, which significantly defrayed an $82 billion deficit in all other advanced technology categories. Indeed, for years aerospace has regularly logged the widest positive trade margin among U.S. manufacturing industries. As for aeronautics’ military significance, the Department of Defense’s (DOD’s) guiding doctrine relies significantly on air superiority and aircraft rapid strike and force-deployment capabilities. Moreover, a variety of aeronautics technologies, such as stealth and unpiloted remote-sensing aircraft and airborne command and control systems, have transformed military operations not only in the air but on the ground and at sea. The centrality is reflected in procurement strategy: A 2005 RAND analysis found that the DOD spends on the order of a third of its procurement budget on aerospace, including about $40 billion every year to buy aircraft and other air systems. Nonetheless, recent signs that the nation’s preeminence in aviation may be imperiled have occasioned deep concern. At least 12 studies of U.S. activity in aeronautics published during the past half decade by the National Academies and various industry and government bodies have called attention to the vulnerability of the United States’ traditional leading position. In its final report, the Commission on the Future of the United States Aerospace Industry, widely known as the Walker Commission, stated that “the critical underpinnings of this nation’s aerospace industry are showing signs of faltering” and warned bluntly, “We stand dangerously close to squandering the advantage bequeathed to us by prior generations of aerospace leaders.” In 2005, the National Aerospace Institute, in a report commissioned by Congress, declared the center of technical and market leadership to be “shifting outside the United States” to Europe, with a loss of high-paying jobs and intellectual capital to the detriment of the United States’ economic well-being. The clear message is that the United States must overcome a series of major challenges—to the capacity, safety, and security of the nation’s air transportation system, to the nation’s ability to compete in international markets, and to the need to reduce noise and emissions—if the nation’s viability in this sector, let alone international leadership, is to be ensured.

### Collapse of US airpower causes global great power wars.

Andres 10 (Richard, Professor of National Security Strategy at the National War College, Up in the Air, American Interest, September – October, http://www.the-american-interest.com/article.cfm?piece=861.)

Rethinking Strategy As the United States completes its withdrawal from Iraq and contemplates how it will extract its forces from Afghanistan, it must reconsider the state of its sea and air forces in light of its long-term strategic goals. As the world’s most powerful state, defense means something different for the United States than it does for other nations. While states usually build militaries to defend or, less frequently these days, to enlarge their territory, the principle purpose of the U.S. military is to defend the global commons and the open international economic order by ensuring peace among the major powers. There is nothing passé about this purpose. When the military might of states like the United States begins to fail, the result is often global instability and conflict. When the Roman legions could no longer support Rome’s military obligations, Europe fell into a dark age. When the British navy could no longer balance the ambitions of Europe’s major powers at the turn of the 20th century, neither economic interdependence nor the League of Nations could prevent the two world wars that followed. If the U.S. military becomes incapable of supporting its international commitments, it is by no means clear that the current long peace among major powers will endure. Cracks in America’s global power projection capabilities are already visible. Thanks largely to the spread of military technologies the United States introduced and procurement decisions it made more than twenty years ago, the U.S. military has lost capability. In the 1990s, for example, the Navy could confidently send a carrier task force through the Straits of Taiwan; today, a ship that attempted such a feat would risk coming under fire from Chinese anti-ship and anti-aircraft missiles. (Some pessimistic analysts even believe that China could win a war in the Straits.) A few years ago, U.S. carriers controlled the Straits of Hormuz; today, carriers in the Gulf could be the first casualty of a war with Iran. As China, Iran and North Korea increase their stocks of ballistic missiles, existing U.S. Army and Air Force bases will become increasingly vulnerable. Big-ticket procurement decisions generally play out over a course of two to four decades. If the United States continues on its current trajectory, within that period U.S. conventional deterrence will lose much of its value abroad. The United States will not necessarily become incapable of defending its friends, but the costs and risks of doing so will grow much higher. As this occurs, U.S. deterrent threats meant to protect Taiwan, the Baltic States, Ukraine, Georgia, Israel, South Korea, Australia and Japan will become increasingly unbelievable. If opponents test U.S. resolve, the United States may be faced with the prospect of either reneging on its commitments or fighting ruinous wars. It is important to get the scale of these potential challenges right: While the counterinsurgency wars in Afghanistan and Iraq have cost more than 5,000 U.S. lives over the past decade, a war over any of the countries listed above could well cost that many lives in the first few minutes of combat. Changing U.S. Military Posture Although the U.S.-led international system cannot last forever, the United States can increase its longevity considerably by executing an intelligent shift in its military posture. We need to reverse the Bush Administration’s move toward a posture emphasizing the transformation of selective enemies into allies through occupation and the creation of democratic political institutions. The current strategy requires the United States to engage in a relatively low-tech, manpower-intensive form of warfare that pits one of its greatest weaknesses against one of its opponents’ greatest strengths. By some calculations, a thousand guerrillas using improvised explosive devices can effectively pin down tens of thousands of state-of-the-art equipped U.S. ground troops. As was the case during the Vietnam War, the United States has attempted to compensate for its disadvantages by throwing vast sums of money at the problem. Well more than $1 trillion has been spent on Iraq and Afghanistan to date, some of it on creative stopgap efforts. If this approach had worked well enough that leaders in Iran, North Korea and similar states believed that it could work again, it would have gone some ways toward extending America’s ability to deter aggressors and maintain the existing system. Unfortunately, it did not. The United States has not achieved the clear, positive and cost-effective outcomes it sought in either Iraq or Afghanistan. As a result, many international leaders believe the United States will be reluctant to use force again in the future. Ironically, then, the U.S. commitment to this form of warfare has reduced its ability to influence the actions of potential opponents. As money becomes scarcer and anti-access threats proliferate, the United States must develop a military posture capable of sustaining the American-led international system over a period of many decades. This means finding ways to pit its strengths in technology and reach against its opponents’ vulnerabilities. It also means working closely with regional allies to deter specific threats. In a sustainable military posture devoted to this larger strategic goal, the Air Force is likely to play a significantly different role than the one currently envisioned for it by defense programmers.

# \*\*\*General Link Work

## 2NC Link Wall

The plan forces internal tradeoffs - Congressional appropriators will cut other NASA programs when there is new spending because of the fiscally constrained environment, that’s Svitak 3/7.

### NASA resources are finite and trade off-

### A. Frozen Budget- NASA’s budget is frozen now – any new increases will trade off with space operations

Svitak, 6/16 [Amy Svitak, Staff Writer – Space News, “President’s Budget Freezes NASA at $18.7 Billion,” June 16, 2011, <http://www.spacenews.com/civil/nasa-budget-frozen-presidents-request.html>, DA 7/24/11]//RS

### The White House unveiled a 2012 budget blueprint Feb. 14 that freezes funding for NASA and other federal agencies at 2010 levels while continuing to invest in top priorities, including technology research and development, nurturing commercial space initiatives and building a heavy-lift rocket and multi-purpose crew vehicle for manned space missions beyond low Earth orbit. The $18.7 billion top-line spending level President Barack Obama is seeking for NASA next year is roughly $300 million less than the 2011 budget plan he sent lawmakers last February and $750 million below the $19.45 billion recommended for the agency in the NASA Authorization Act of 2010, which Obama signed in October. Obama's budget would put NASA more than $700 million behind the $19.45 billion forecasted for 2012 in the budget proposal the president sent Congress last year but never saw enacted. Despite the flat request for 2012, the president's NASA budget provides at least some new funding for top priorities directed in the authorization measure, and in some cases exceeds levels set for specific programs. For example, if Obama’s request is approved, NASA would have $850 million to spend on commercial space initiatives in 2012, $350 million more than called for in the authorization act. The request also calls for spending $1.024 billion on space technology research and exploration technology development, roughly $100 million more than the $923 million called for in the authorization act. The request would fund $1.8 billion in 2012 to begin development of a new heavy-lift launch vehicle and $1 billion to continue developing NASA’s Orion crew capsule as directed in the NASA Authorization Act of 2010, which Obama signed into law in October. However, the combined $2.8 billion that would fund the development is less than half the roughly $4 billion congressional authorizers directed in the NASA bill. Obama's proposal includes $1.78 billion for Earth science programs in 2012, some $160 million less than called for in the authorization act but still about $360 million more than the agency's current Earth science budget. NASA's overall Science budget — which includes Earth science, astrophysics, heliophysics and planetary science —would top $5 billion in 2012, a roughly $500 million increase over the current budget but less than previously forecast. These and other targeted increases would be funded by reducing NASA's Space Operations budget by $1.8 billion relative to the 2010 level. Those savings would be realized by retiring the space shuttle later this year.

### B. Program execution- must trade-off with each other

SSB 06 (Space Studies Board, AN ASSESSMENT OF BALANCE IN NASA’S SCIENCE PROGRAMS, http://www.nap.edu/openbook.php?record\_id=11644&page=33)

A problem has arisen, however, in the execution of a number of the missions. Decadal surveys offer advice on the full range of science in their discipline. They rank missions to be pursued by category—large, medium, and small; they offer advice on R&A programs; and they balance the aspirations of the various subdisciplines. They perform this ranking and offer this advice based on NASA estimates of the costs of the missions and of the overall funding that is likely to be available for the discipline. A number of missions in development, however, are costing substantially more than they were estimated to cost at the time of the decadal survey that recommended them, with the result that it is not now possible to execute the broad range of programs recommended in the decadal surveys for these disciplines on the recommended timescales. In particular, within the current funding constraints, it is not possible to maintain the proper balance among large, medium, and small missions, or with R&A programs, nor is it possible to maintain a vibrant program in all the various subdisciplines.

### Empirically true- NASA administrators empirically cut science research to fund exploration

SSB 06 (Space Studies Board, AN ASSESSMENT OF BALANCE IN NASA’S SCIENCE PROGRAMS, http http://www.nap.edu/openbook.php?record\_id=11644&page=6)

Thus, a broad program of scientific studies continues to be an integral element of NASA’s charter, but a challenge remains to accomplish a balanced scientific program within a broader, balanced portfolio of commitments that also must include human spaceflight and aeronautical research. In presenting NASA’s proposed program and budget for FY 2007 to the House Science Committee on February 16, 2006, Administrator Griffin said, “The plain fact is that NASA simply cannot afford to do everything that our many constituencies would like the agency to do. We must set priorities, and we must adjust our spending to match those priorities. NASA needed to take budgeted funds from the Science and Exploration budget projections for FY 2007-11 in order to ensure that enough funds were available to the Space Shuttle and the ISS. Thus, NASA can not afford the costs of starting some new space science missions.” With respect to research in the microgravity sciences Griffin noted, “While NASA needed to significantly curtail projected funding for biological and physical sciences research on the [ISS] as well as various research and technology projects in order to fund development for the CEV [Crew Exploration Vehicle], the U.S. segment of the [ISS] was designated a National Laboratory in the NASA Authorization Act…. However, the research utilization of the ISS is limited primarily due to limited cargo and crew transportation.”

C. Congressional debates

### NASA issues trigger debate over major issues in Congress – including mission, priorities, and methods

Morgan, 10 [Daniel Morgan, Congressional Research Service, Congressional Research Service specialist in science and technology policy, Congressional Research Service, “The Future of NASA: Space Policy Issues Facing Congress”, p.2-3, July 8, 2010,

opencrs.com/document/R41016/]

What Is NASA For? During the Eisenhower Administration, after the Soviet Union’s launch of the first artificial satellite, Sputnik, but before the establishment of NASA, the President’s Science and Advisory Committee identified four “principal reasons for undertaking a national space program”: • “the compelling urge of man to explore and to discover”; • “defense ... to be sure that space is not used to endanger our security ... [and to] be prepared to use space to defend ourselves”; • to “enhance the prestige of the United States ... and create added confidence in our scientific, technological, industrial, and military strength”; and • “scientific observation and experiment which will add to our knowledge and understanding of the Earth, the solar system, and the universe.”6 To these objectives, analysts today add • the potential for technologies developed for the space program to have direct and indirect (“spinoff”) economic benefits; • the opportunity to use space activities as a tool of international relations, through collaboration on projects such as the International Space Station; and • the ability of the space program to inspire students and promote education in science, technology, engineering, and mathematics (STEM). These goals form a foundation for U.S. space policies, but policy makers differ in how they should be balanced against each other. Is the urge to discover a sufficient reason to explore space, or must exploration also meet needs here on Earth? Should economic benefits be an explicit focus for NASA or just a positive side effect? To what extent should improving STEM education be a NASA function, as opposed to a consequence of its other functions? Should the emphasis of international space programs be competition or cooperation? The priorities that Congress assigns to these objectives may determine how it balances the competing demands of NASA’s programs. For example, if Congress believes that national prestige is a high priority, it could choose to emphasize NASA’s high-profile human exploration activities, such as establishing a Moon base or exploring Mars. If scientific knowledge is a high priority, Congress could emphasize unmanned missions such as the Hubble telescope and the Mars rovers. If international relations are a high priority, Congress could encourage joint space activities with other nations. If economic benefits are of interest, Congress could focus on technological development, linking NASA programs to the needs of business and industry.

### Finite Human Capital- Adding a program will tradeoff with current management staff

Dinerman 08 [Taylor - a well-known and respected space writer regarding military and civilian space activities. “NASA and space solar power”. May 19, 2008 ayc http://www.thespacereview.com/article/1130/1]

**NASA has good reason to be afraid that the Congress or maybe even the White House will give them a mandate to work on space solar power at a time when the agency’s budget is even tighter than usual** and when everything that can be safely cut has been cut. This includes almost all technology development programs that are not directly tied to the Exploration Missions System Directorate’s Project Constellation. Not only that, the management talent inside the organization is similarly under stress. **Adding a new program might bring down the US civil space program like a house of cards**.

### D. NASA’s resources, management and funding are limited

Chaplain, 10 [Cristina Chaplain, Director of Acquisition and Sourcing Management United States Government Accountability Office, February 3, 2010, Congressional Testimony, Congressional Quarterly, Inc., NASA CHALLENGES; COMMITTEE: HOUSE SCIENCE AND TECHNOLOGY; SUBCOMMITTEE: SPACE AND AERONAUTICS, DA 7/30/11]//RS

In executing NASA's space exploration, scientific discovery, and aeronautic research missions, NASA must use its resources as effectively and efficiently as possible because of the severity of the fiscal challenges our nation faces and the wide range of competing national priorities. Establishing a sound business case before a project starts should also better position NASA management to deliver promised capability for the funding it receives. While space development programs are complex and difficult by nature, and most are one-time efforts, the nature of its work should not preclude NASA from being accountable for achieving what it promises when requesting and receiving funds. Congress will also need to do its part to ensure that NASA has the support to hold poorly performing programs accountable in order to provide an environment where the systems portfolio as a whole can succeed with the resources NASA is given. NASA shows a willingness to face these challenges. We look forward to continuing work with NASA to develop tools to enhance the management of acquisitions and agency operations to optimize its investment in space and aeronautics missions.

## Yes Tradeoff

### Cost overruns sap resources from other NASA programs

Holdren, 5/4 [John Holdren, CQ Transcriptions, Office of Science and Technology Policy Director, “REP. FRANK R. WOLF HOLDS A HEARING ON THE OFFICE OF SCIENCE AND TECHNOLOGY BUDGET”, May 4, 2011]

HOLDREN: ...the -- the essence of the matter is, in part, you are right that we've known since early in the previous administration that -- that the shuttle program needed to come to an end. It needed to come to an end for a number of reasons, one of them being that this is basically 1970s technology which, in some sense, is -- is -- is so complicated and so fragile you see the results in the fraction of the time that we end up having to postpone launches for the safety of the astronauts which, obviously, has to remain paramount. But it was also the case that the shuttle is so expensive to operate that while you're operating it you can't find the money in any plausible NASA budget to develop its replacement. And so it was recognized already in the Bush administration. They made that decision that the shuttle would be phased out. And the problem was that the successor program to the shuttle, the Constellation Program -- that was going to provide both access to low Earth orbit and the heavier capabilities for -- for deeper space missions -- never got the budgets it needed to stay on track. And the result was, by the time we came into office the Constellation Program was in danger of being three to four times over budget -- that is, over the originally anticipated costs -- for those vehicles.And in addition, it was so far behind schedule that no amount of money poured into it at this point could erase the gap in the capability to put American astronauts on the space station on -- on U.S. rockets. At the same time, the attempt within NASA to find enough money to keep Constellation on track had sapped the resources available for many of NASA's other programs.

### Limited resources force trade-offs within NASA programing

Morgan, 10 [Daniel Morgan, Congressional Research Service, Congressional Research Service specialist in science and technology policy, “The Future of NASA: Space Policy Issues Facing Congress”, p.6, July 8, 2010, opencrs.com/document/R41016/]

Issue for Congress: Cost and Schedule Cost is likely to play a central role as congressional policy makers oversee the Vision’s progress and consider proposals to modify it. During the Bush Administration, NASA stressed that its strategy was to “go as we can afford to pay,” with the pace of the program set, in part, by the available funding.18 The original plan in 2004 proposed adding a total of just $1 billion to NASA’s budget for FY2005 through FY2009 to help pay for the Vision, with increases thereafter limited to the rate of inflation. Subsequent Administration budgets more than eliminated this increase, and actual appropriations by Congress were even less. As a result, most funding for the Vision has been redirected from other NASA activities, such as the planned termination of the space shuttle program.

### Competing interpretations of NASA’s purpose ensure priorities compete

Morgan, 10 [Daniel Morgan, Congressional Research Service, Congressional Research Service specialist in science and technology policy, “The Future of NASA: Space Policy Issues Facing Congress”, p.17, July 8, 2010, opencrs.com/document/R41016/]

Balancing these competing priorities depends on answering questions, raised earlier in this report, about NASA’s purpose. More than 50 years ago, President Eisenhower’s advisors were aware that a space program was justified both by “the compelling urge of man to explore and to discover” and by “scientific observation and experiment which will to add to our knowledge and understanding.” Today, there is still no consensus about how to balance these purposes. Some policy makers believe that a space program can best be justified by tangible benefits to economic growth and competitiveness. Others believe that its most important role is to be a source of national pride, prestige, and inspiration.

### Plan forces a tradeoff in funds and focus – erodes other programs

Enderle, 10 [Rob Enderle, president and principal analyst of the Enderle Group, the Enderle group is a forward-looking emerging technology advisory firm Long Beach and got a B.S. in Manpower Management, MBA “NASA Re-Mission Illustrates Good, Bad Business Practice” IT Business edge, April 15, 2010, <http://www.itbusinessedge.com/cm/blogs/enderle/nasa-re-mission-illustrates-good-bad-business-practice/?cs=40703>]

The primary goal for the space race wasn’t scientific advancement or even exploration, it was getting a foothold first on a potential strategic military asset -- space -- and focusing a nation on something other than its problems. But as each milestone was achieved, the reason for the program became increasingly muddy. As a result, milestones started drifting out and funding also became increasingly elusive.   This is true of many, if not most, long-term projects that last longer than the executives who started them. It is actually kind of amazing that the United States made it to the moon given that the president who started the effort died prematurely well before that goal was achieved.   As governments and companies age, the executives who run them change. The motivations for projects can erode, and companies can lose focus. NASA went from being a national program firmly based on national security to one that seemed far less focused, [had more problems](http://www.popsci.com/military-aviation-amp-space/gallery/2009-03/top-10-nasa-probe-failures) and became more difficult to fund. Early Warning:  Drifting Milestones While the United States arrived at the moon reasonably quickly, its later milestones -- moon bases, space stations, manned expeditions to Mars -- started drifting out massively.  It took less than a decade to put the first man on the moon, but the shuttle likely should have been a commercial project in the first place given that it was more like a scheduled delivery and repair service. Probes and robots continued to go out, but the program's energy had largely evaporated.   While it might not have been externally clear what was broken, when milestones start shifting out by years or especially decades, it indicates a program that needs to be rethought or shut down. Otherwise, such projects become a money hole with little or no chance of achieving their remaining goals and  objectives.   Starting Over When those funding a project lose track of the program's goals or no longer find them compelling, it's generally best to pull the plug on the project or radically redesign it. From that point on, it'll be tough to get funding and those remaining backers will be increasingly dissatisfied. It is generally better to significantly change direction on a project and focus the remaining funds on achievable goals.   Large companies and governments tend to suffer from too many projects that are all underfunded and failing. It is always better to have fewer fully funded projects because it increases the chance of success with some of them. That means either cutting underfunded projects or redesigning them against current goals and resources.   Wrapping Up:  The NASA Lesson Like any major project, once the initial goal is achieved, the effort needs to be revalidated. Long-term projects need to be under constant review to make sure their goals remain achievable with the available funding. If they aren’t, the hard choices are to increase funding to make the goals achievable, to alter the goals to match the funding or to cut funding entirely. The world often changes a great deal in a decade. Programs that last longer than this likely need to be heavily altered to assure they remain relevant or they are likely to be discontinued outright.   Management is paid to make hard decisions. Sometimes the hardest is to realize that you simply can’t afford to do anything and to pick those things you can do. It is generally better to do a few things well than a lot of things poorly.

### Resources tradeoff – shuttle proves

Morgan, 10 [Daniel Morgan, Congressional Research Service, Congressional Research Service specialist in science and technology policy, “The Future of NASA: Space Policy Issues Facing Congress”, p.17-18, July 8, 2010, opencrs.com/document/R41016/]

Why the Shuttle Program Is Ending The oldest shuttle is approaching 30 years old; the youngest is approaching 20. Although many shuttle components have been refurbished and upgraded, the shuttles as a whole are aging systems. Most analysts consider the shuttle design to be based, in many respects, on obsolete or obsolescent technology. The original concept of the shuttle program was that a reusable launch vehicle would be more cost-effective than an expendable one, but many of the projected cost savings depended on a flight rate that has never been achieved. Over the years, NASA has attempted repeatedly, but unsuccessfully, to develop a second-generation reusable launch vehicle to replace the shuttle. In 2002, NASA indicated that the shuttle would continue flying until at least 2015 and perhaps until 2020 or beyond. The Columbia disaster in 2003 forced NASA to revise that plan. Within hours of the loss of the space shuttle Columbia and its seven astronauts, NASA established the Columbia Accident Investigation Board to determine the causes of the accident and make recommendations for how to proceed.68 The board concluded that the shuttle “is not inherently unsafe” but that several actions were necessary “to make the vehicle safe enough to operate in the coming years.”69 It recommended 15 specific actions to be taken before returning the shuttle to flight. In addition, it found that because of the risks inherent in the original design of the space shuttle, because the design was based in many aspects on now-obsolete technologies, and because the shuttle is now an aging system but still developmental in character, it is in the nation’s interest to replace the shuttle as soon as possible as the primary means for transporting humans to and from Earth orbit.70 The board recommended that if the shuttle is to be flown past 2010, NASA should “develop and conduct a vehicle recertification at the material, component, subsystem, and system levels” as part of a broader and “essential” Service Life Extension Program.71 The announcement of the Vision for Space Exploration in 2004 created another reason to end the shuttle program: money. Before the shuttle program began to ramp down, it accounted for about 25% of NASA’s budget. Making those funds available for the Vision became a primary motivation for ending the program.

## Yes Tradeoff – Budget Freeze Now

### The NASA budget is frozen – new policies have to trade off

Moskowitz, 2/14 [Clara Moskowitz, Senior Writer – Space.com, “President Obama Freezes NASA’s Budget at 2010 Levels,” February 14, 2011, <http://www.space.com/10845-nasa-2012-budget-announcement-obama.html>, DA 7/24/11]//RS

The Obama administration has announced its 2012 budget request, which if approved would freeze spending for NASA and other federal agencies at 2010 levels for the next fiscal year. The 2012 budget request allocates $18.7 billion for NASA, the same amount the agency received in 2010. That's about $300 million less than NASA received in the president's 2011 budget request. "The times today are very difficult fiscally, and we're going to live within a budget," NASA administrator Charles Bolden said at a press conference today. "What we do has to be affordable, sustainable, and it has to make sense." The move is part of an overall five-year freeze on non-security discretionary spending that the White House is proposing. "The fiscal realities we face require hard choices," President Barack Obama wrote in his statement on the new budget. "A decade of deficits, compounded by the effects of the recession and the steps we had to take to break it, as well as the chronic failure to confront difficult decisions, has put us on an unsustainable course. That's why my budget lays out a path for how we can pay down these debts and free the American economy from their burden." The new budget request applies to the 2012 fiscal year, which begins Oct. 1, 2011. This preliminary proposal, however, is likely to be modified by Congress.

### NASA budget is frozen – new projects must trade-off

Harwood, 11 [William - CNET Blog Network author, “ NASA 2012 budget reflects 'tough choices,' uncertain outlook,” 2/14/2011, http://news.cnet.com/8301-19514\_3-20031912-239.html]

Faced with reduced funding and an uncertain outlook, NASA's $18.7 billion fiscal 2012 budget prioritizes the Obama administration's major goals and objectives, focusing on maintaining the International Space Station, retiring the shuttle and ramping up efforts to spur development of commercial manned spacecraft. The budget also reflects the administration's commitment to building a new heavy-lift rocket and a crew capsule that could be used for deep-space exploration. But the budget follows the administration's proposal to freeze federal funding at 2010 levels for the next five years, resulting in a $276 million decrease for NASA compared to the agency's 2011 budget. Until Congress weighs in with actual funding, it's not clear when a viable United States manned spacecraft will emerge to service the station or when eventual deep-space missions might occur. In the meantime, with the shuttle's retirement looming after a final three missions, NASA will continue to rely on Russia to provide transportation to and from the space station aboard Soyuz spacecraft at about $55 million a seat. "This budget requires us to live within our means so we can invest in our future," NASA Administrator Charlie Bolden told reporters. "It maintains our strong commitment to human spaceflight and new technologies. It establishes critical priorities and invests in excellent science, aeronautics research and education programs that will help us win the future." Because "these are tough fiscal times, tough choices had to be made," he said. "Our No. 1 priority is safely flying out the shuttle and maintaining the safety and well being of the American astronauts currently living and working in space." NASA is working under a continuing resolution that requires the agency to operate at 2010 funding levels. The $19 billion fiscal 2011 budget remains in limbo, as does precise funding to begin ramping up work on commercial manned spacecraft, the new heavy lift launcher and the multipurpose crew vehicle NASA is planning for deep-space exploration.

## Yes Tradeoff – Congress

### Congress is hostile to space spending – New policies require tradeoffs

Svitak, 1/28 [Amy Svitak, Space News Staff Writer, “NASA’s Overbudget Mars Rover in Need of Another Cash Infusion,” January 28, 2011, <http://www.spacenews.com/civil/110128-mars-rover-need-cash.html>, 2011] NOTE: Jim Green, director of NASA’s Planetary Sciences Division in the U.S. space agency’s Science Mission Directorate

However, finding the additional money could prove challenging in the current budget environment. Although NASA’s Planetary Sciences Division had been slated for a 10 percent annual increase, to $1.49 billion, in 2011, Congress has yet to adopt a spending plan for the federal government this year, leaving NASA and other agencies operating at last year’s spending levels under a continuing resolution approved in December. In addition, Republican leaders in the U.S. House of Representatives are proposing to roll back discretionary spending even further, to 2008 levels, for most federal agencies, including NASA. Green said the continuing resolution under which NASA will operate through at least March 4 gives the division $144 million less than the White House proposed for the current budget year, including a $115 million shortfall in the division’s Mars program, which is managed by the Jet Propulsion Laboratory (JPL) in Pasadena, Calif. Still, Green said his division is prepared to look internally for resources to cover the MSL cost growth, starting with JPL and the roughly $400 million budgeted for Mars exploration programs under the continuing resolution. “The program office is on notice that they’ll have to skinny down,” Green said. “We have little flexibility to cut back our operating missions … although there is some. We’ll have to see what’s operating that should move on.”

### Congress will force an internal tradeoff for new spending

Svitak, 3/29 [Amy Svitak; Senior Writer – Space.com, “NASA’s Budget Could Get Infusion From Other U.S. Departments,” March 29, 2011, <http://www.space.com/11247-nasa-budget-funding-commerce-justice-departments.html>, DA 7/24/11]//RS

Congressional appropriators could tap the funding accounts of the U.S. departments of Commerce and Justice to help cover what some see as a $1 billion shortfall in NASA’s $18.7 billion spending plan for 2012, which allocates less money for a heavy-lift rocket and crew capsule than Congress directed last year. “There’s over a billion-dollar difference between the budget request and the authorized levels in [20]12 for the launch system and the crew vehicle, and now that falls squarely back on the shoulders of [the appropriations committees] to try and figure out where to come up with that money,” said a panelist at a March 23 breakfast on Capitol Hill. Sponsored by Women in Aerospace (WIA), the breakfast was held under the Chatham House Rule, an 84-year-old protocol fashioned by the London-based nonprofit think-tank to promote frank discussion through anonymity. [What Obama and Congress Should Do for Spaceflight] The panelist, one of six whose names and job titles were circulated by WIA prior to the meeting, said funding requested in NASA’s 2012 spending plan does not square with levels Congress set in the NASA Authorization Act of 2010 that U.S. President Barack Obama signed into law in October. Specifically, the request called for spending $1.2 billion less than the $4 billion Congress authorized for the heavy-lift launch vehicle and crew capsule in 2012. At the same time, the request includes $350 million more than the $500 million Congress authorized to nurture development of commercial vehicles to deliver cargo and crews to the International Space Station after the space shuttle retires later this year. Consequently, the panelist said, it is now up to congressional appropriators “to find a billion dollars in other places in NASA to pay for those activities or to decide to make those tradeoffs and take that money out of the departments of Commerce or Justice or the other agencies that are funded in the same bill as NASA.” NASA’s annual appropriation is part of a broader spending package totaling nearly $65 billion that funds the U.S. Commerce and Justice departments, the National Science Foundation, the National Institute of Standards and Technology and related agencies. But with NASA and other federal agencies operating in a fiscally constrained environment, the panelist said Congress could struggle to fund new multibillion-dollar programs next year. “It’s not impossible but the ability to do that is severely constrained in the environment we’re working in now, and that’s exacerbated by budget requests coming up from the administration that don’t track with the authorization,” the panelist said. Congress has yet to pass an appropriations bill for 2011, leaving NASA and most federal agencies to subsist at 2010 spending levels in the current budget year. The panelist said passing spending legislation for NASA “is a complicated and challenging thing this year, and it will be again next year” given a fiscal climate that has changed dramatically authorized funding levels for the space agency were set last fall. However, the panelist said the appropriations subcommittees that fund NASA are “very supportive of the agency, they’re supportive of the authorization, they want to see NASA get as close as possible to those authorized levels, so that will be a work in progress.”

## Yes Tradeoff- Human capital

### NASA’s human capital is finite

Neuhäuser 03 (Stephan, Department of International Cooperation within the Austrian Research Ministry, NASA Under Scrutiny: The Columbia Disaster Sparks Debate Over NASA’s Future, http://www.ostina.org/V/print/nasa\_print.pdf)

NASA is not troubled only by the problem-ridden, and now grounded, Shuttles and having to maintain an obviously insufficient, but nevertheless, costly space station. According to the General Accounting Office (GAO, http://www.gao.com), human capital management is one of the top challenges NASA faces now and in the near future: Since 1993, NASA has cut jobs down from 25,000 to approximately 19,000 today. About 25% of the remaining, highly-qualified workforce – 60% of NASA employees hold either a masters or doctorate degree in science and engineering – is eligible for retirement within the next 5 years. In some NASA Centers, expertise is only “one-deep,” meaning that even a single retirement can be critical. “NASA’s challenges will soon become its crisis in human capital management…. Today, NASA’s ability to maintain a world-class workforce with the talent it needs to perform cutting-edge work is threatened by several converging trends. Each trend in isolation is a concern; in concert, the indicators are alarming.” This warning was recently voiced by Sean O’Keefe, NASA’s current administrator.

## Yes Tradeoff- independent missions

### NASA has difficulty promoting projects independent of missions

Morgan, 10 [Daniel Morgan, Congressional Research Service, Congressional Research Service specialist in science and technology policy, “The Future of NASA: Space Policy Issues Facing Congress”, p.13-14, July 8, 2010, opencrs.com/document/R41016/]

In recent years, Congress has sought to ensure that NASA’s science program includes a balanced variety of approaches to R&D rather than focusing only on certain types of missions. For example, the NASA Authorization Act of 2008 stated that the science program should include space science missions of all sizes as well as mission-enabling activities such as technology development, suborbital research, and research and analysis (R&A) grants to individual investigators.44 According to the National Research Council, “practically all relevant external advisory reports have emphasized the importance of mission-enabling activities,” but determining their proper scale has been challenging “throughout NASA’s history.”45 In the past few years, funding for planetary science technology has increased significantly, but funding for Earth science technology has increased only slightly; the astrophysics and heliophysics programs do not have dedicated technology subprograms. Funding for suborbital rocket operations increased from $51 million in FY2008 to $66 million in FY2010, but the trend is unclear as the latter amount was down from $77 million in FY2009. Funding for R&A grants, which NASA controversially proposed to reduce significantly as recently as FY2007, has recovered as the result partly of the Administration’s own initiatives and partly of congressional action on appropriations legislation. In December 2009, the National Research Council recommended ways to make the mission-enabling activities of NASA’s science programs more effective through more active management. These recommendations included establishing explicit objectives and metrics, making budgets more transparent, and clearly articulating the relationships between mission-enabling activities and the ensemble of missions they are intended to support.46 The NASA Authorization Act of 2008 stated that the technology development program should include long-term activities that are “independent of the flight projects under development.”47 NASA may sometimes find it challenging to balance this independence against the goal of linking mission-enabling activities to the missions they support.

## Link- General (Moon/Mars Exploration)

### New exploration trades off with the science budget

Chyba, 5/19 [Christopher Chyba, Professor of Astrophysical Sciences and International Affairs - Princeton University, May 19 2011, “Hearing on Contributions of Space to National Imperatives”, <http://www.spaceref.com/news/viewsr.html?pid=37102>, DA 7/24/11]//RS

 Moreover, if NASA's space science budget is not protected, it could be raided to fund cost overruns in the human program. Human spaceflight, if it is to be justified and sustained, needs to be aligned with national priorities. Were key space-based research to be cut to fund human spaceflight, human spaceflight would be put into opposition with those priorities. This would serve neither science nor the future of human spaceflight well. We live in a time of extraordinary discoveries about outer space. We have learned that early Mars had standing liquid water on its surface, and that the resulting sedimentary rocks are still accessible. These are the kind of rocks that can contain information about the early martian environment, or even microfossils should life ever have existed on that world. We've learned that there are many other ocean worlds in our Solar System--moons of the outer planets that host liquid water oceans beneath their ice covers that are as big as our own. We've learned that solar systems are common, and that the arrangement of planets in our own is but one of a vast array of possibilities. And we've learned that most of the mass-energy of the Universe is not made up of the kind of matter we are familiar with here on Earth--and that we don't quite know what this more exotic mass-energy is. Human spaceflight should be an ally in, and certainly not an opponent of, these momentous discoveries. Third, the Human Spaceflight Committee report called for the government's space agency to concentrate on the hardest technological problems associated with our goals in space flight. For the rest, including sending astronauts into low-Earth orbit, the commercial sector should play a bigger role. The commercial sector should "fill in" behind NASA, while NASA spearheads exploration out into the Solar System. In fostering a robust commercial sector, NASA's role would include funding, in a disciplined way, the development of capabilities by a number of commercial actors, developing the technologies to underpin future exploration, and providing an ongoing market pull for the commercial sector by providing destinations--whether this is the ISS or destination projects, such as the development and implementation of potentially game- changing capabilities such as fuel depots in space. Fourth and finally, the Committee report called for budget and schedule reality. The report argued that the budget then foreseen for human spaceflight--$99 billion over ten years--would not allow NASA to do anything beyond low-Earth orbit. NASA could afford to pay for the new rockets and crew vehicle that would replace the space shuttle and make it possible to journey outward, but not for systems to land on the Moon or for operations on a path to take astronauts to asteroids or to fly around Mars. The report suggested that in order to do both--to develop the new systems and to fly them to destinations beyond low-Earth orbit--would require an increase in NASA's budget of around $3 billion per year.

### Overall NASA budget is extremely tight --- new exploration missions trade-off with Earth science

NAST 8 [NASA Aeronautics Support Team (Non-Profit Organization of Community Leaders, Business Leaders, and Former NASA Officials), “NASA’s Role in the 21st Century”, Fall, http://nastus.org/documents/NASARole.21st Century.pdf]

From its humble beginning as NACA in 1915 to its glorious period of moon landings, to its post cold-war doldrums, the agency has had one singular calling card, innovation in aerospace contributing to the economic and military superiority for the United States. In recent years, a new exploration vision has been launched, but it requires little innovation, and the science missions that have generated the most new knowledge and innovation within NASA have declined due to budget cuts. In the process the internal capacity of the agency to innovate has seriously eroded. It is time to reawaken NASA’s spirit of innovation in aerospace before it is no longer possible. In so doing, NASA will once again become a vital contributor to our national capacity to innovate, the only sure way to maintain our global economic and military leadership in a world economy rapidly evolving into innovation and knowledge driven economy. The reawakening of NASA’s spirit and capacity to innovate will involve a major reinvention and reconstitution of the Agency. A major challenge that must be faced in such a reinvention is commitment of the bulk of the Agency’s budget to replacement of the Space Shuttle through the Constellation program, so as to be able to guarantee nearterm full utilization of the International Space Station for meaningful scientific research. Current plans also call for a lunar landing by the end of the next decade (c. 2020). It is clear that the next President will review the strategic value and operational challenges to make that objective the next critical milestone beyond the Shuttle’s retirement. Whether the next Administration decides to continue on the current path of the moon first and then on to Mars for human exploration, it is critical that this mission plan not come at the expense of NASA’s other historical and continually relevant missions in space science, Earth science, and aeronautics, which form the core of NASA knowledge creation and innovation. As a result, the next evolution of space policy should carefully assess how these multiple missions can progress so that NASA’s core missions are not compromised by the evolution of the Agency’s human exploration objectives1.

### Even small funding cuts crush the effectiveness of NASA’s programs

Conley, 10 [Richard Conley, Professor of Political Science University of Florida, “The Perils of Presidential Leadership on Space Policy: The Politics of Congressional Budgeting for NASA, 1958-2008”, APSA 2010 Annual Meeting Paper, <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1642810>]

The situation is that much more problematic given NASA’s size.  NASA is a small agency.  Even relatively small cuts to the agency’s budget requests have considerable ramifications for ongoing and future programs.  Figure 2 shows changes in NASA personnel since 1958.  The first y-axis traces the number of civilian employees.  The second y-axis tracks the percent annual change in NASA civilian personnel.  The data show relative stability in the agency’s workforce at approximately 21,000 in the last four decades.  But the upshot is that a cut of $1 billion to the president’s NASA budget request equates to an annual loss of $47,000 per employee.  The ramifications are also highly significant for NASA contractors in the private sector, who typically number about 40,000—twice the agency’s personnel.  The data accentuate the mismatch between human and financial resources necessary for long-term, large scale space programs and congressional appropriations. It is rare that any NASA program that can rely on one year’s worth of funding.  The reality is that the vast majority of space exploration projects require years of commitment while the budgeting process occurs on a yearly basis.  Sharp cuts to a project’s budget in the middle of its lifetime can mean drastic cuts to a program’s capabilities or results.  The space shuttle is a prime example of this phenomenon.  Combined with the tendency of elected representatives to consider their ability to justify programs to their constituents on a two year (House) or six year (Senate) electoral cycle, highly technical and long-term projects within NASA regularly face unstable budgets (Kay 1995).

### Science and space budget tradeoff; kills NASA goals

Friedman 2/7 [Lou - Director of the Society's LightSail Program and remains involved in space programs and policy. “Merging human spaceflight and science at NASA”. February 7, 2011 ayc http://www.thespacereview.com/article/1775/1]

Unfortunately, there is another side to NASA’s story—the human spaceflight program stuck in Earth orbit, mired in politics, and drifting from proposal to proposal, never alighting on one long enough to have a clear purpose. It doesn’t have to be this way. For years, I, along with others, have been calling for more integration of science and exploration. With some justification, many science advocates fear such a melding, worrying that integration would mean their projects would be eaten up by the larger human spaceflight program. That is a legitimate concern if human spaceflight remains without a science or exploration goal. Instead of human spaceflight swallowing science, I’d like to see the reverse: science swallowing human spaceflight by focusing it on exploration. Make exploration more than the name of a program office. The bollixing up of NASA’s program planning by last year’s Congress and the emphasis on budget cuts by this year’s Congress create a severe challenge for the future of human spaceflight. But that challenge also creates an opportunity. Perhaps now is the time to return to that post-Columbia accident debate about the purpose of human spaceflight, to examine what is worth the high cost and high risk of humans in space. I have no doubt that the answer will remain what it has always been when those debates were held: the exploration of other worlds. Much has been written about shrinking NASA’s Apollo legacy infrastructure. That has proved politically impossible as members protect local interests of NASA centers and industry. But there is a shift now, propelled by reduced spending and pressures for reduced government. One possible result is putting a lid on NASA spending and then pushing the lid down to make everything smaller. That would be too bad: goals, missions, accomplishments, and NASA’s very purpose would all diminish.

### NASA focus of space exploration takes away from sciences

Olsen 06 [Stefanie - staff writer at CNET news, “NASA budget emphasizes space exploration”, 2/6/6, <http://news.cnet.com/NASA-budget-emphasizes-space-exploration/2100-11397_3-6035753.html#ixzz1PsWvN4gW>]

MOUNTAIN VIEW, Calif.--Science will play a diminishing role at NASA as the space agency emphasizes lunar exploration in the next five years, according to a new governmental budget. NASA Administrator Michael Griffin, who was appointed to the office by the Bush administration only 10 months ago, announced a $16.8 billion budget request for NASA on Monday, per recommendations from President Bush. The budget, outlined in a press briefing here at NASA Ames Research Center, is a 3.2 percent rise over expected 2006 spending. It comprised about 0.7 percent of the federal budget. "This is a modest investment to extend the frontiers of space exploration, scientific discovery and aeronautics research," Griffin said. NASA's spending, Griffin said, will concentrate on implementing Bush's Vision for Space Exploration, a plan the president announced roughly two years ago to launch human missions to the moon. Science, such as studying the solar system or the origin of the universe, will play a lesser role at NASA organizations, resulting in cutbacks to divisions like astrobiology studies and life sciences at Ames Research Center.

## Link- Exploration (General)

### Its zero-sum- Exploration trades off with NASA funds

Chameides, 9 [Bill Chameides, Dean and Nicholas Professor of the Environment – Duke University, “Is NASA Spacing Out?”, The Green Grok, July 20, 2009, <http://www.nicholas.duke.edu/thegreengrok/moonwalk>, DA 7/24/11]//RS

Do Manned Space Expeditions Make Sense? Now there’s a plan afoot to again send humans where only [12 men](http://en.wikipedia.org/wiki/List_of_Apollo_astronauts) have boldly gone before. The new [mission](http://www.cbsnews.com/stories/2009/07/17/tech/cnettechnews/main5168126.shtml) would first send people to the Moon for weeks and weeks at a time, and graduate to a manned mission to Mars. Cool, just like landing men on the moon was cool back in the ‘60s and ‘70s, even to a long-haired college student crisscrossing Europe. But I have to ask, given today’s budget crunch and the advancements in robotics, is cool enough of a reason to send humans to the moon and beyond? Don’t get me wrong; learning about the planets and stars, [dark matter](http://www.wired.com/science/discoveries/news/2003/05/58966) and [dark forces](http://www.llewellyn.com/bookstore/article.php?id=909) is one of humanity’s greatest intellectual endeavors. Not only should we fix our gaze on space; we must. But manned missions are not the only way to learn about our world. Virtually all of the aforementioned information about the Earth was obtained using unmanned space-borne platforms. And unmanned missions to the planets have provided us with a wealth of information (at a fraction of the [**cost**](http://www.truthnews.net/world/2004080046.htm)) — for example we've been able to do detailed, [**complex analyses**](http://www.space.com/scienceastronomy/090702-phoenix-soil.html) of soil from Mars without the benefit of a human hand. Deciding what NASA does with its funds has always been somewhat of a zero sum game. Doing more of one thing generally means doing less of another. And there's a clear trade-off between high-visibility, manned, space exploration and unmanned missions that are able to bring home the scientific bacon without all the hoopla**.** Already grumbles from my colleagues at NASA indicate that the push to prepare for a Mars mission is siphoning off funds from already [beleaguered](http://www.nicholas.duke.edu/thegreengrok/satellitenetwork) Earth-observing programs. Given all the issues we face right here at home (did anyone say climate change?), this doesn't make sense.

### Exploration missions are massively expensive --- forces internal trade-offs with Earth science

NAST 8 [NASA Aeronautics Support Team (Non-Profit Organization of Community Leaders, Business Leaders, and Former NASA Officials), “NASA’s Role in the 21st Century”, Fall, http://nastus.org/documents/NASARole.21st Century.pdf]

The budget needs of the Human Space Flight program (shuttle support, ISS development and assembly and now CEV/Orion) have forced significant reductions in the budgets of its other missions. Aeronautics in particular has been hollowed out (it historically has comprised about 10% of NASA’s budget, but has been slashed by almost 70%, to 3% of the agency’s annual outlay), while the space and Earth science areas are just now also experiencing some of that same budget pain. The economic challenges faced by the US in the 21st century include the rapid development of innovation-driven economies in Europe and Asia, and the restructuring of our energy supply driven by the convergence of peak oil and climate change. Given the right grand challenges and sufficient funding, NASA can help the US maintain its global preeminence by providing the investor/early adopter role in the key technologies that will shape the development of civilization in the coming decades. In that context, our proposed set of grand challenges for NASA is: 1) Intelligent, robotic exploration of the solar system and universe. 2) Monitoring and predicting climate change and the impact of mitigation strategies. 3) Stimulating the reinvention of the US air transportation system into an environmentally friendly, safe and energy efficient system. 4) Development of the replacement for the Space Shuttle and continuation of human space exploration. There is still the spirit of exploration in much of what NASA does today, no more so than the programs that produce the robotic explorers of the universe. While no one disputes that exploration and discovery in our universe and beyond must remain a key part of NASA, it is a very real question as to how best to achieve the maximum amount of exploration/discovery given real budget, technology and time constraints. Given that human space exploration is massively expensive, one should ask the obvious question, “Should NASA’s continued exploration of the Moon, Mars, and other worlds involve just a handful of humans (astronauts), or should this exploration program be restructured so that it will provide the opportunity for all humans to explore?” Robotic explorers will increasingly provide, through the technologies of machine intelligence,8 virtual reality, and high bandwidth communication, a near-real-time space exploration experience to all citizens, making everyone a virtual astronaut instead of a privileged few. Further, not requiring the development and fielding of future exploration systems that protect humans from the harsh environment of space will radically reduce the cost and time required to explore other worlds. With current projections showing that machine intelligence will begin to rival human intelligence by the beginning of the third decade of this century, the argument that human intelligence is required as the primary emphasis in space exploration is greatly diminished.

### Funding human exploration creates a political opportunity to defund Earth sciences - Congress will cut the program to keep overall budgeting level

Space Politics, 2/9 [Space Politics, “Human Spaceflight versus Earth Sciences?,” February 9, 2011, <http://www.spacepolitics.com/2011/02/09/human-spaceflight-versus-earth-sciences/>]

A letter signed by several members of Congress is the latest evidence that a new battle line is forming over NASA funding: human spaceflight versus Earth sciences. In [a letter to House Appropriations committee chairman Rep. Hal Rogers and CJS subcommittee chairman Frank Wolf](http://posey.house.gov/UploadedFiles/NASAAppropsLetter-Feb2011.pdf), six Republican members of Congress asked the appropriators to prioritize NASA funding on what they consider to be the agency’s primary mission, human spaceflight. To do that, they argue that funding for NASA’s climate change research be redirected to human spaceflight accounts. “With your help, we can reorient NASA’s mission back toward human spaceflight by reducing funding for climate change research and reallocating those funds to NASA’s human spaceflight accounts, all while moving overall discretionary spending towards FY2008 levels,” the letter’s authors—Reps. Bill Posey (R-FL), Pete Olson (R-TX), Rob Bishop (R-UT), Jason Chaffetz (R-UT), Sandy Adams (R-FL), and Mo Brooks (R-AL)—argue. There are a number of issues with the letter. They claim that NASA spent “over a billion dollars” on “studying global warming/climate change” in FY2010. The agency got about $1.4 billion for all Earth sciences research in FY10, [according to agency budget documents](http://www.nasa.gov/pdf/432577main_Earth_Science_R1.pdf). There’s no breakout for how much of that went specifically to climate change research, though. The letter also claims that the “lion share” of NASA’s share of stimulus funding went to climate change studies. In fact, only about a third of the agency’s stimulus funding, $325 million, [went to Earth sciences programs](http://www.recovery.gov/Transparency/agency/reporting/agency_reporting5program.aspx?agency_code=80&progplanid=7540), to accelerate development of Earth science spacecraft. Human spaceflight got even more:[$400 million](http://www.recovery.gov/Transparency/agency/reporting/agency_reporting5program.aspx?agency_code=80&progplanid=7541), including $50 million for the CCDev program. And their claim that NASA’s core mission is human spaceflight is not supported by other documents, ranging from the [National Aeronautics and Space Act](http://www.nasa.gov/offices/ogc/about/space_act1.html) from 1958 to the latest [NASA authorization act](http://legislative.nasa.gov/PL%20111-267.pdf), which declared that NASA “is and should remain a multi-mission agency with a balanced and robust set of core missions in science, aeronautics, and human space flight and exploration” and that “NASA plays a critical role through its ability to provide data on solar output, sea level rise, atmospheric and ocean temperature, ozone depletion, air pollution, and observation of human and environment relationships”. A bigger issue, though, is that this letter may be indicative of a bigger battle some in Congress want to wage between human spaceflight and Earth science. Some members have openly expressed their skepticism about the validity of climate change research, questioning either the existence of global warming or the role of human activities in causing climate change. The letter to appropriators makes no judgment on the quality of validity of such research, only NASA’s role in supporting it, but some might see that unspoken argument there. For example, one of the letter’s signers, Rep. Brooks, said last week in regards to NASA funding that [there would be “hearings soon on global warming” by the House science committee](http://blog.al.com/breaking/2011/02/congress_will_cut_defense_cong.html) without going into more details. An attack on Earth sciences funding to support human spaceflight could create or reinvigorate opponents of human spaceflight programs, reminiscent of previous debates between human spaceflight and robotic space exploration advocates—a battle that the agency presumably would want to avoid.

### Space exploration costs too much and trades off with NASA’s R & D sectors- Current NASA budget dilemma proves (MOON, MARS)

Kaku, 9 [Michio Kaku, professor of theoretical physics at the City University of New York, “The Cost of Space Exploration,” July 16, 2009, <http://www.forbes.com/2009/07/16/apollo-moon-landing-anniversary-opinions-contributors-cost-money.html>, DA 7/25/11]//RS

But after 1969, the Soviets dropped out of the race to the moon and, like a cancer, the land war in Asia began to devour the budget. The wind gradually came out of the sails of the space program; the Nielsen ratings for each moon landing began to fall. The last manned mission to the moon was Apollo 17, in 1972. As Isaac Asimov once commented, we scored a touchdown, then took our football and went home. After all is said and done about what went wrong, the bottom line is simple: money. It's about $10,000 to put a pound of anything into a near-earth orbit. (Imagine John Glenn, the first American to orbit the earth, made of solid gold, and you can appreciate the enormous cost of space travel.) It costs $500 to $700 million every time the shuttle flies. Billionaire space tourists have flown to the space station at a reputed price of $20 million per head. And to put a pound of anything on the moon costs about 10 times as much. (To reach Mars, imagine your body made of diamonds.) We are 50 years into the space age, and yet space travel is just as expensive as it always was. We can debate endlessly over what went wrong; there is probably no one correct answer. But a few observations can be made. The space shuttle, the workhorse of the space program, proved to be somewhat of a disappointment, with large cost overruns and long delays. It was bloated and probably did not need to have seven astronauts on board. (The Soviet copy of the space shuttle, a near-clone called the Buran, actually flew into outer space fully automated, without any astronauts whatsoever.) An alternative to the space shuttle was the original space plane of the Eisenhower era. It was to be small and compact, but provide easy access to space on a moment's notice, instead of the long months to prepare each shuttle launch. It was to take off and land like a plane, but soar into outer space like a rocket. President Ronald Reagan called one version of it the "Orient Express." (Ironically, now there will be a hiatus as the space shuttle is mothballed next year. Instead of fast and cheap access to space, for five years we will have no access to space at all. We'll have to beg the Europeans and Russians to piggy-back off their rockets.) **One of the primary missions of NASA should have been to drive down the cost of space travel. Instead of spending half a billion dollars on each shuttle mission, it should have diverted some of the funds to make research and development a primary focus.** New materials, new fuels and innovative concepts, which would make space exploration less expensive, should have been prioritized. (Today, some of that entrepreneurial spirit still lives in the commercial sector, as it tries to nourish a fledgling space tourism industry.) The space station costs upward of $100 billion, yet its critics call it a "station to nowhere." It has no clearly defined scientific purpose. Once, President George H.W. Bush's science adviser was asked about the benefits of doing experiments in weightlessness and microgravity. His response was, "Microgravity is of microimportance." Its supporters have justified the space station as a terminal for the space shuttle. But the space shuttle has been justified as a vehicle to reach the space station, which is a completely circular and illogical argument.

## Link- Constellation (Earth Science)

### Funding Constellation is extremely expensive --- trades-off with NASA’s focus on Earth science

Pelton 10 [Joseph N., Research Professor – Institute for Applied Space Research at the George Washington University, “A New Space Vision for NASA—and for Space Entrepreneurs Too?”, Space Policy, 26(2), May, p. 78]

Some have suggested that President Barack Obama's cancellation of the unwieldy and expensive Project Constellation to send astronauts back to the Moon for a few exploratory missions was a blow to NASA and the start of the end of the US space program. The truth is just the reverse. Project Constellation, accurately described by former NASA Administrator Michael Grifﬁn as “Apollo on Steroids” provided little new technology or innovation and had an astronomical price tag. It was clearly too much for too little. If the opportunity costs of Project Constellation are examined (i.e. if we think what could have been done with an extra $100 billion of space funds), dumping it deﬁes argument. With much less invested in a questionable Project Constellation enterprise we can do much more in space astronomy. We can invest more wisely in space science to learn more about the Sun, the Earth and threats from Near Earth Objects. David Thompson, Chairman and CEO of Orbital Sciences said the following in a speech that endorsed the new commercial thrust of the NASA space policies on Nine February 2010: “Let us, the commercial space industry, develop the space taxis we need to get our Astronauts into orbit and to ferry those wanting to go into space to get to where they want to go. We are in danger of falling behind in many critical areas of space unless we shift our priorities” [10].

## Link- Colonization

### Colonization is really expensive.

SSB 06 (Space Studies Board, AN ASSESSMENT OF BALANCE IN NASA’S SCIENCE PROGRAMS, http://www.nap.edu/openbook.php?record\_id=11644&page=9)

Finally, NASA’s longer-term planning for human exploration provides an important context in which to consider the long-term prospects for science. Although NASA has not yet released a specific strategic plan for exploration activities on the Moon, which are to begin in the 2018 timeframe, the resource demands to support development of the needed exploration systems will be considerable. Office of Management and Budget representatives described to the committee an exploration systems budget profile that would grow to $8.8 billion in 2011 and then to over $14 billion in 2015, not including provisions for science or aeronautics.

## Link- Moon

### A mission to the moon trades off with NASA’s budget for climate science

Albanesius 10 [Chloe – East Coast News editor, writer for PCMag, “Obama Budget Cuts Moon Program, Boosts R&D”, 2/1/10, http://www.pcmag.com/article2/0,2817,2358658,00.asp]

President Obama on Monday unveiled a $3.8 trillion budget for fiscal year 2010, a plan that includes increased funding for tech-related research and education, as well a push for more Internet-based government services, but cuts funding for a NASA moon program and several surveillance and grant programs the White House considered to be wasteful. "In the aftermath of this crisis, what is clear is that we cannot simply go back to business as usual," President Obama said in a statement. "We cannot go back to an economy that yielded cycle after cycle of speculative booms and painful busts. We cannot continue to accept an education system in which our students trail their peers in other countries, and a health-care system in which exploding costs put our businesses at a competitive disadvantage and squeeze the incomes of our workers. We cannot continue to ignore the clean energy challenge and stand still while other countries move forward in the emerging industries of the 21st Century. And we cannot continue to borrow against our children's future, or allow special interests to determine how public dollars are spent." Among the programs on the chopping block are NASA's Constellation Systems Program, an effortto put astronauts back on the Moon by 2020. The $3.466 billion program, which started in 2005, is woefully behind schedule, and a review conducted in May 2009 found that the program probably won't put anyone on the Moon until well into the 2030's**.** Instead, the White House would increase NASA's overall budget in order to focus on climate science, green aviation, science education, and other priorities. It would also encourage NASA to leverage advanced technology, international partnerships, and commercial capabilities in its quest to return to the Moon.

### Moon mission will cost in the hundreds of billions

Morgan, 7/8 [Daneil Morgan, Congressional Research Service specialist in science and technology policy, July 8, 2011, Congressional Research Service, “The Future of NASA: Space Policy Issues Facing Congress”, p.6,

opencrs.com/document/R41016/]

NASA has not provided a cost estimate for the Vision as a whole. In 2004, it projected that developing capabilities for human exploration, not including robotic support missions, would cost a total of $64 billion up through the first human return to the Moon.19 The Congressional Budget Office (CBO) concluded that, based on historical trends, the actual cost could be much higher.20 In its 2005 implementation plan, NASA estimated that returning astronauts to the Moon would cost $104 billion, not including the cost of robotic precursor missions or the cost of servicing the ISS after the end of the shuttle program.21 In 2007, the Government Accountability Office (GAO) estimated the total cost for the Vision as $230 billion over two decades.22 In April 2009, as directed in the 2008 authorization act, the CBO updated its 2004 budgetary analysis of the Vision. It found that NASA would need an additional $2 billion per year through FY2025 to keep the Vision activities on schedule, not counting probable cost growth in other activities.23 In October 2009, the Augustine report stated that executing NASA’s current plans would require an additional $3 billion per year, even with some schedule delays.24

### Lunar Mining would require multiple billion dollar investments

Schmitt, 4 [Harrison H. Schmitt, Former NASA Astronaut, “Mining the Moon,” Popular Mechanics, October 2004, <http://www.popularmechanics.com/science/space/moon-mars/1283056>, DA 7/24/11]//RS

Lunar Mining Samples collected in 1969 by Neil Armstrong during the first lunar landing showed that helium-3 concentrations in lunar soil are at least 13 parts per billion (ppb) by weight. Levels may range from 20 to 30 ppb in undisturbed soils. Quantities as small as 20 ppb may seem too trivial to consider. But at a projected value of $40,000 per ounce, 220 pounds of helium-3 would be worth about $141 million. Because the concentration of helium-3 is extremely low, it would be necessary to process large amounts of rock and soil to isolate the material. Digging a patch of lunar surface roughly three-quarters of a square mile to a depth of about 9 ft. should yield about 220 pounds of helium-3--enough to power a city the size of Dallas or Detroit for a year. Although considerable lunar soil would have to be processed, the mining costs would not be high by terrestrial standards. Automated machines might perform the work. Extracting the isotope would not be particularly difficult. Heating and agitation release gases trapped in the soil. As the vapors are cooled to absolute zero, the various gases present sequentially separate out of the mix. In the final step, special membranes would separate helium-3 from ordinary helium. **The total estimated cost for fusion development, rocket development and starting lunar operations would be about $15 billion.** The International Thermonuclear Reactor Project, with a current estimated cost of $10 billion for a proof-of-concept reactor, is just a small part of the necessary development of tritium-based fusion and does not include the problems of commercialization and waste disposal. The second-generation approach to controlled fusion power involves combining deuterium and helium-3. This reaction produces a high-energy proton (positively charged hydrogen ion) and a helium-4 ion (alpha particle). The most important potential advantage of this fusion reaction for power production as well as other applications lies in its compatibility with the use of electrostatic fields to control fuel ions and the fusion protons. Protons, as positively charged particles, can be converted directly into electricity, through use of solid-state conversion materials as well as other techniques. Potential conversion efficiencies of 70 percent may be possible, as there is no need to convert proton energy to heat in order to drive turbine-powered generators. Fusion power plants operating on deuterium and helium-3 would offer lower capital and operating costs than their competitors due to less technical complexity, higher conversion efficiency, smaller size, the absence of radioactive fuel, no air or water pollution, and only low-level radioactive waste disposal requirements. Recent estimates suggest that about $6 billion in investment capital will be required to develop and construct the first helium-3 fusion power plant. Financial breakeven at today's wholesale electricity prices (5 cents per kilowatt-hour) would occur after five 1000-megawatt plants were on line, replacing old conventional plants or meeting new demand. New Spacecraft Perhaps the most daunting challenge to mining the moon is designing the spacecraft to carry the hardware and crew to the lunar surface. The Apollo Saturn V spacecraft remains the benchmark for a reliable, heavy-lift moon rocket. Capable of lifting 50 tons to the moon, Saturn V's remain the largest spacecraft ever used. In the 40 years since the spacecraft's development, vast improvements in spacecraft technology have occurred. For an investment of about $5 billion it should be possible to develop a modernized Saturn capable of delivering 100-ton payloads to the lunar surface for less than $1500 per pound.

### Mining the Moon would cost billions of dollars

Lasker, 6 [John; Wired: Science, “Race to the Moon for Nuclear Fuel,” December 15, 2006, <http://www.wired.com/science/space/news/2006/12/72276>]

However, there are those who doubt helium-3 could become the next super fuel. Jim Benson, founder of space contractor SpaceDev, which helped build SpaceShipOne's engine and is a subcontractor of the Missile Defense Agency, said mining the moon for helium-3 doesn't pass the "net energy analysis" test. It would require more energy to retrieve helium-3 and bring it back than it would yield. Just, sending mining equipment to the moon, and then returning processed helium-3 back to earth, would cost billions in rocket fuel, said Benson. "We just don't have a need for helium-3," he said. "It's not practical."

## Link- SBSP

### NASA will have a hard time working on solar power with budget cuts

Dinerman, 08 [Taylor Dinerman, “NASA and space solar power”, May 19th, 2008, Access Date\_7/28/11)

NASA has good reason to be afraid that the Congress or maybe even the White House will give them a mandate to work on space solar power at a time when the agency’s budget is even tighter than usual and when everything that can be safely cut has been cut. This includes almost all technology development programs that are not directly tied to the Exploration Missions System Directorate’s Project Constellation. Not only that, the management talent inside the organization is similarly under stress. Adding a new program might bring down the US civil space program like a house of cards.

### NASA incapable of doing solar power alone

Dinerman, 08 [Taylor Dinerman, “NASA and space solar power”, May 19th, 2008, Access Date\_7/28/11)

Eventually NASA will have to play a role, even if a small one, in the development of space solar power. The best option is that it will be as part of an interagency process directly supervised from the White House, with lots of Congressional and private sector input. The debate on this new energy source has hardly begun and these are lots of very smart people with very strong opinions on the subject.

### Solar power development too expensive for NASA

Dinerman, 08 [Taylor, “NASA and space solar power”, May 19th, 2008, Access Date\_7/28/11]

Obviously space solar power could provide a reliable, non-polluting, and very large-scale source of energy. The biggest question is, can it be done economically? Frankly, with its history of problematic cost estimates, NASA (or any other government institution) is not going to provide us with a trustworthy answer. The decision to go ahead will be a shot in the dark. If we can clearly see that low-cost access to space via the private sector is going to be a reality, then whoever is president will have a solid basis on which to proceed.

## Link- Mars

### Its zero-sum: Mars plans would trade off with the science budget that is already on the brink of depletion

Robinson, 8 [Michael Robinson, Professor of History at Hillyer College, August 4, 2008, “Lessons from the last frontier”, <http://www.thespacereview.com/article/1181/1>, DA 7/25/11]//RS

NASA gears up for the next ambitious chapter in human space exploration. NASA's course has been shaped by tragic events. The destruction of Challenger in 1986 and Columbia in 2003 brought about much soul searching, and strengthened the agency's commitment to safety. Yet NASA has focused most of its attention on improving the methods of exploration, rather than assessing its merits. They have chosen to honor their fallen comrades by focusing on the construction of better machines, not the development of better missions. Consider President Bush's 2004 speech “A Renewed Spirit of Discovery,” in which he lays out his vision for the U.S. space program. The document runs a little over 1,400 words. Boiled down, it says this: send Americans back into space, first to the Moon, then Mars. NASA now proceeds accordingly, gearing up, as Americans did a century ago, to send very brave people to very distant places. **But space exploration is a zero-sum game**. Sending astronauts to Mars (a planet now studied efficiently by rovers, orbiters, and most recently, the Phoenix Mars Lander) **requires an enormous investment that will come at the expense of smaller, more useful, scientific projects.** Already NASA plans to cut millions of dollars from the space science budget to cover the costs of developing the Constellation Program. A manned mission to Mars, if it happens, will be a dazzling event guaranteed to keep us glued to our televisions. But symbolism alone cannot carry the US space program forward. One hundred years ago, Americans faced the same dilemma on the Arctic frontier. In their relentless pursuit of the North Pole, explorers had abandoned science. After Robert Peary claimed the discovery of the North Pole in 1909, American scientists breathed a sigh of relief. Finally, scientific exploration of the Arctic could begin in earnest. Franz Boas, professor of anthropology at Columbia University, expressed the mood of scientists then, but he could have been expressing the opinion of many scientists now.

### Cost overruns will cause funding raids on Earth science accounts --- devastates the program

Chyba 11 [Christopher, Professor of Astrophysical Sciences and International Affairs – Princeton University, “Hearing on Contribution of Space to National Imperatives”, Space Ref, 5-19, <http://www.spaceref.com/news/viewsr.html?pid=37102>, DA 7/22/11]//RS

Second, the report insists on scientific integrity. Each option presented for consideration was examined for its impact on science, and all else being equal options that did a better job furthering science were rated more highly. But human spaceflight should not be justified with exaggerated claims about its scientific payoff. Exploration with astronauts can have significant scientific benefits in several areas beyond the tautological justification of studying what happens to humans in space. As was emphasized by scientists' testimony to the committee, astronauts have a tremendous advantage over robot spacecraft when it comes to field geology in particular. The ability to pick up a rock, turn it over, expose a fresh surface with a hammer and then use geological expertise to decide whether to move on or instead to "dig in" and examine the current site in detail is a human capability that far exceeds anything robot rovers can currently do. In a similar way, the ability to service and repair space[observatories](http://www.spaceref.com/news/viewsr.html?pid=37102) that face unanticipated problems favors the astronaut over the robot. But astronauts are also far more expensive than robot spacecraft or rovers, and have their greatest advantage in the most complex environments and circumstances. Mars is the most complicated surface environment we will face in the foreseeable future, so it is where astronauts will provide the greatest advantage. But it will be decades before humans walk on that world--if we are lucky--and for most other science in space, humans often get in the way. Moreover, if NASA's [space science](http://www.spaceref.com/news/viewsr.html?pid=37102) budget is not protected, it could be raided to fund cost overruns in the human program. Human spaceflight, if it is to be justified and sustained, needs to be aligned with national priorities. Were key space-based research to be cut to fund human spaceflight, human spaceflight would be put into opposition with those priorities. This would serve neither science nor the future of human spaceflight well.

### Going to Mars trades off with science funding

Chameides, 9 [Bill Chameides, Dean of Duke's Nicholas School of the Environment, July 20 2009, “Is NASA Spacing Out?”, <http://www.nicholas.duke.edu/thegreengrok/moonwalk>, DA 7/24/11]//RS

Now there's a plan afoot to again send humans where only 12 men have boldly gone before. The new mission would first send people to the Moon for weeks and weeks at a time, and graduate to a manned mission to Mars. NASA satellites are important to the study of Earth. (NASA) Cool, just like landing men on the moon was cool back in the '60s and '70s, even to a long-haired college student crisscrossing Europe. But I have to ask, given today's budget crunch and the advancements in robotics, is cool enough of a reason to send humans to the moon and beyond? Don't get me wrong; learning about the planets and stars, dark matter and dark forces is one of humanity's greatest intellectual endeavors. Not only should we fix our gaze on space; we must. But manned missions are not the only way to learn about our world. Virtually all of the aforementioned information about the Earth was obtained using unmanned space-borne platforms. And unmanned missions to the planets have provided us with a wealth of information (at a fraction of the cost) -- for example we've been able to do detailed, complex analyses of soil from Mars without the benefit of a human hand. Deciding what NASA does with its funds has always been somewhat of a zero sum game. Doing more of one thing generally means doing less of another. And there's a clear trade-off between high-visibility, manned, space exploration and unmanned missions that are able to bring home the scientific bacon without all the hoopla. Already grumbles from my colleagues at NASA indicate that the push to prepare for a Mars mission is siphoning off funds from already beleaguered Earth-observing programs. Given all the issues we face right here at home (did anyone say climate change?), this doesn't make sense.

### Mars exploration would cost trillions of dollars and trade off with other programs – disad turns the case

Easterbrook, 4 [Gregg Easterbrook, Fellow – Brookings Institution, “Why We Shouldn’t Go to Mars,” January 26, 2004, [http://www.time.com/time/magazine/article/0,9171,993172-1,00.html](http://www.time.com/time/magazine/article/0%2C9171%2C993172-1%2C00.html)]

Two centuries ago, Meriwether Lewis and William Clark left St. Louis to explore the new lands acquired in the Louisiana Purchase," George W. Bush said, announcing his desire for a program to send men and women to Mars. "They made that journey in the spirit of discovery ... America has ventured forth into space for the same reasons." Yet there are vital differences between Lewis and Clark's expedition and a Mars mission. First, Lewis and Clark were headed to a place amenable to life; hundreds of thousands of people were already living there. Second, Lewis and Clark were certain to discover places and things of immediate value to the new nation. Third, the Lewis and Clark venture cost next to nothing by today's standards. In 1989 NASA estimated that a people-to-Mars program would cost $400 billion, which inflates to $600 billion today. The Hoover Dam cost $700 million in today's money, meaning that sending people to Mars might cost as much as building about 800 new Hoover Dams. A Mars mission may be the single most expensive nonwartime undertaking in U.S. history. The thought of travel to Mars is exhilarating. Surely men and women will someday walk upon that planet, and surely they will make wondrous discoveries about geology and the history of the solar system, perhaps even about the very origin of life. Many times I have stared up at Mars in the evening sky--in the mountains, away from cities, you can almost see the red tint--and wondered what is there, or was there. But the fact that a destination is tantalizing does not mean the journey makes sense, even considering the human calling to explore. And Mars as a destination for people makes absolutely no sense with current technology. Present systems for getting from Earth's surface to low-Earth orbit are so fantastically expensive that merely launching the 1,000 tons or so of spacecraft and equipment a Mars mission would require could be accomplished only by cutting health-care benefits, education spending or other important programs--or by raising taxes. Absent some remarkable discovery, astronauts, geologists and biologists once on Mars could do little more than analyze rocks and feel awestruck beholding the sky of another world. Yet rocks can be analyzed by automated probes without risk to human life, and at a tiny fraction of the cost of sending people. It is interesting to note that when President Bush unveiled his proposal, he listed these recent major achievements of space exploration: pictures of the rings of Saturn and the outer planets, evidence of water on Mars and the moons of Jupiter, discovery of more than 100 planets outside our solar system and study of the soil of Mars. All these accomplishments came from automated probes or automated space telescopes. Bush's proposal, which calls for "reprogramming" some of NASA's present budget into the Mars effort, might actually lead to a reduction in such unmanned science--the one aspect of space exploration that's working really well. Rather than spend hundreds of billions of dollars to hurl tons toward Mars using current technology, why not take a decade--or two decades, or however much time is required--researching new launch systems and advanced propulsion? If new launch systems could put weight into orbit affordably, and if advanced propulsion could speed up that long, slow transit to Mars, then the dream of stepping onto the Red Planet might become reality. Mars will still be there when the technology is ready. Space-exploration proponents deride as lack of vision the mention of technical barriers or the insistence that needs on Earth come first. Not so. The former is rationality, the latter the setting of priorities. If Mars proponents want to raise $600 billion privately and stage their own expedition, more power to them; many of the great expeditions of the past were privately mounted. If Mars proponents expect taxpayers to foot their bill, then they must make their case against the many other competing needs for money. And against the needs for health care, education, poverty reduction, reinforcement of the military and reduction of the federal deficit, the case for vast expenditures to go to Mars using current technology is very weak. The drive to explore is part of what makes us human, and exploration of the past has led to unexpected glories. Dreams must be tempered by realism, however. For the moment, going to Mars is hopelessly unrealistic.

### A mission to Mars would cost billions

Hough, 10 [Andrew Hough, Sunday Telegraph, “NASA Unveils Bold Plans to Send Humans ‘One-Way to Mars to Colonise Planet,’” October 28, 2010, <http://www.telegraph.co.uk/science/space/8091965/Nasa-unveils-bold-plans-to-send-humans-one-way-to-Mars-to-colonise-planet.html>]

Space agency officials confirmed feasability studies were under way to asses whether astronauts could be permanently sent to the red planet, or its moons, to establish human colonies. The multi-billion pound mission, titled Hundred Years Starship, is being spearheaded by the Ames Research Centre, one of Nasa’s main research centres, based in Moffett Field, California. Officials from the Pentagon's Defence Advanced Research Projects Agency (DARPA) are also heavily involved in turning the science fiction idea into a reality. Early estimates put the cost of such a mission, which has “just started” at more than £7 billion and could be achieved by 2030. Scientists have been given £600,000 government grant – including £100,000 from Nasa – to start research into the idea, according to US reports.

## Link- Space Debris

### Space Debris removal would be massively expensive

Woellert, 9 [Kirk Woellert, Former Navy Intelligence Office with Experience in Space Systems and Information Technology and Current Graduate Student at the Space Policy Institute – George Washington University, “Space Debris: Why the US Cannot Go It Alone,” The Space Review, <http://www.thespacereview.com/article/1373/1>, DA 7/24/11]//RS

A recent article in The Space Review claims the US should deal with the issue of space debris unilaterally (see “Unilateral orbital cleanup”, May 4, 2009). A complete analysis of individual space debris removal strategies is beyond the scope of this forum. For that matter, even the question of a passive or active strategy for dealing with space debris is a complex issue by itself. The purpose herein is to look at one active space debris strategy proposal and point out some technical and policy implications. The conclusion is the US cannot afford to, nor should it attempt to, deal with space debris on its own. Technical Considering the assertion in that article: What is required is a new type of space maneuver vehicle, one that can rendezvous with, catch, and store a bit of debris, and then proceed to the next one. Such a vehicle would not need to move very fast: the process would be a leisurely one, and thus would allow for the use of a highly efficient space propulsion system such as a pulse plasma thruster or ion engine. The proposal is for a dedicated spacecraft to maneuver and capture individual pieces of space debris. The proposed vehicle would rely on ultra-efficient propulsion such as ion or plasma arc-jet thrusters. On the surface the concept may appear sound. However, it’s worthwhile to delve into a bit of orbital mechanics. First, there are thousands of space debris objects actively tracked and many thousands more that are not tracked. Although on a large scale there are clusters and gaps in the debris field, each of these objects are in unique orbits. Various types of orbital maneuvers would need to be continuously executed. These maneuvers will include changes in the vehicle altitude, period, right ascension, and inclination. A first order analysis of the mission profile would consider the most costly maneuver in terms of energy, a change in orbital inclination. Typically such analysis calculates the change in velocity or “deltaV” required to perform a maneuver. Although there are relative concentrations at select inclinations between roughly 60° and 100°, space debris takes on many inclination values spanning 0°–100°. Atmospheric drag dominates for circular orbits below about 200 kilometers. Hence any space debris orbiting at or below these altitudes will decay in a reasonable period of time. For purposes of this discussion, consider a space debris collection satellite performing an inclination change at an altitude of 500 kilometers. The orbital velocity for a satellite at any altitude is given by: (1) V = GMe/r where; G = universal gravitational constant Me = mass of the earth r = Radius of the earth plus the altitude of the satellite Using these values, the orbital velocity V = 7613 m/s. This would be the initial velocity of the spacecraft prior to any maneuver. Next let’s calculate the velocity change required for an inclination plane change. The formula for deltaV for an inclination change is: (2) deltaV = 2 x (Vi) x Sin (theta/2), where: Vi = initial velocity of the spacecraft prior to the maneuver Theta = angle between the planes of the initial and final orbits As a minimal case, what is the deltaV required for a 1° inclination change? From equation (2); Vi = 7613 m/s, theta = 1, resulting in a deltaV = about 66 m/s. Ion propulsion is very efficient and while propellant requirements are important, in this context they are less of a mission driver than the time required for maneuvers. How long must a typical ion thruster fire to achieve a deltaV of 66 m/s? A review of the literature shows calculating this involves tradeoffs and intermediate calculations that are probably beyond the scope of this forum. Instead we can draw upon real world experience and observations of aerospace professionals. The NASA Dawn spacecraft, which utilizes a contemporary ion thruster, can be a reference case. The Dawn web site quotes its ion engines at full thrust can achieve a velocity change of “0-60mph in 4 days”. That is equivalent to a deltaV of 27 m/s in 4 days. For this discussion the acceleration in this case should be computed: v = 27 m/s t = 4 days = 345,600 sec (1) a = v/t = (27 m/s) / (345600 sec) = 7.8 x 10e-5 m/sec2 or .00078 m/sec2 How long would the Dawn spacecraft need to achieve a 66 m/sec deltaV? Solving for t in equation (1): t = v/a = (66 m/sec) / (.00078 m/sec2) = 844,800 sec = 9.7 days Per the aforementioned analysis, a 1° change in inclination would require 9.7 days. This time does not include fine orbit maneuvers required to close to within a reasonable distance to the target debris. Another limiting factor to this concept is the mission profile does not allow for the advantage of continuous acceleration often cited for ion propulsion. Continuing on with the analysis, NORAD tracks about 19,000 objects in orbit. Assume half of these objects, or 9,500, require an inclination plane change maneuver of at least 1° for the vehicle to achieve co-orbit with the target. This implies the time to capture these objects would be (9,500 x 9.7 days) = **254 years**. Admittedly this analysis is simplistic but it gives some sense of the time scale involved. Ion engine operation is limited by erosion of thruster elements caused by exposure to charged particles of the exhaust stream. Current ion thruster technology has demonstrated continuous firing for 3.5 years. The ion thrusters on the Dawn spacecraft launched in 2007 have a design mission life of 5.5 years. In either case, it’s well short of the two and half centuries for a single spacecraft to address a significant portion of all debris on orbit. An ongoing program to replace aged vehicles would be needed. To achieve practical results in a reasonable time frame, a constellation of such vehicles would be needed. A program of such scope is obviously a multi-billion dollar initiative. It should be noted that many of the logistical and technical challenges of removing space debris are similar to those involved with ballistic missile defense. A space debris collector capturing a space debris object is subject to the same orbital mechanics as a kinetic ASAT. A space- or ground-based laser used to vaporize small pieces of debris is subject to the same physics as a laser used for destroying ballistic missile or adversary satellites. The US has not elected unilaterally field a global ballistic missile defense system in part due to the huge costs and technical challenges. Why would a space debris removal system be any different? It seems reasonable to assume, based on this “back of the envelope” analysis, that the technical and resource challenges involved with eliminating the space debris hazard would be daunting for the US to achieve on its own. Policy From a policy perspective a unilateral approach by the US is counter to historical precedent and trends in US space policy. The ISS the most audacious example to date of international cooperation cost an estimated $100 billion to design and deploy. Would the ISS exist today if the U.S. were the only country willing to pony up the money? Space science program managers appear to want more international cooperation. Indeed, as noted in this publication, NASA and ESA are actively working to promote international cooperation in space science programs as a way to address limited budgets (see “Doing more for less (or the same) in space science”, The Space Review, May 4, 2009). The U.S. civil space budget is already under considerable stress with the competing requirements of safely retiring the Space Shuttle, operating the ISS, and pursuing the Constellation program. It seems improbable Congress would appropriate the additional funding for NASA to effectively clean up space debris. The assertion that space debris is a problem best left to the DOD seems misguided. The US military budget is already committed to fighting wars in Iraq, Afghanistan, and, as evident in recent news, may need to commit resources to stabilize Pakistan. The DOD space acquisition track record is not exactly a paragon of success with several major programs experiencing major cost and schedule overruns (e.g. NPOESS, FIA). More fundamentally, assigning the responsibility of cleaning up space debris to the DOD has implications for the US as a signatory to the Outer Space Treaty. As space assets are dual-use by nature, what prevents a space debris removal vehicle from also performing in the role as a space adversary ASAT? Conclusion Space debris concerns all spacefaring nations and should be addressed as an international issue utilizing a multilateral approach. International cooperation takes significant time to build consensus and on occasion has led to ineffectual results. Nevertheless, the US can best protect its interests in space not by unilateral action but by using its influence and leadership to establish an effective international response to mitigating—and perhaps one day eliminating—the hazard of space debris.

### Merely tracking debris would cost billions of dollars

Brinton, 10 [Turner Brinton, Space News Staff Writer, “U.S. and Australia Join Forces to Track Space Junk,” November 16, 2010, <http://www.space.com/9539-australia-join-forces-track-space-junk.html>]

The United States operates a worldwide network of ground radars and optical telescopes for tracking objects in space, though its ability to track objects orbiting over the Southern hemisphere is quite limited. The primary U.S. system for tracking objects in low-Earth orbit is the Air Force Space Surveillance System –known as the Space Fence – which comprises three Very High Frequency radar transmission sites and six receive sites spread across the southern United States. The Air Force since 2006 has been studying options for replacing the Space Fence with a system capable of tracking a greater number of smaller objects in low and medium Earth orbit. In June 2009, the service awarded $30 million contracts to Lockheed Martin Corp., Raytheon Co. and Northrop Grumman Corp. to conduct trade studies and prototyping for a new Space Fence. [Worst Space Debris Moments in History] The Air Force stopped funding Northrop Grumman’s contract in February, and Lockheed Martin and Raytheon recently completed their respective system design reviews and have submitted cost estimates for building the new system. On Oct. 20, the Air Force issued a request for proposals for the next phase of the program, for which it will issue up to two 18-month contracts worth $107 million each to continue Space Fence development through preliminary design review. When this phase is complete in 2012, the service plans to choose one prime contractor to build the system. The entire system is expected to cost more than $3.5 billion to complete, according to an Oct. 27 Air Force press release.

## Link- Space Weapons

### Space weapons are massively expensive

Anzera, 5 [Guiseppe Anzera, Asia Times, “Star Wars: Empires Strike Back,” August 18, 2005, <http://www.atimes.com/atimes/Front_Page/GH18Aa01.html>]

The second problem is economic. Orbital weapons - as the Strategic Defense Initiative showed in the 1980s - are extremely expensive. It has been estimated that a space defense system against weak ballistic missile strikes could cost between $220 billion and $1 trillion. A laser-based system to be used against ballistic missiles would cost about $100 million for each target. For instance, the Future Imagery Architecture - a project aimed at the implementation of new spy satellites, which are vital to identify targets for space weapons - has already reached a cost of $25 billion. It is a legitimate question, therefore, whether Washington really needs to finance such projects in today's geostrategic context. Moreover, would these tools be cost-effective in relation to their real operational capability? The first question raises doubts and the second one remains, at the moment, without answer. Henceforth, such initiatives resemble more and more Reagan's programs.

### Space weaponization is prohibitively expensive

Weiner, 5 [Tim Weiner, New York Times, “Air Force Seeks Bush’s Approval for Space Weapons Programs,” May 18, 2005, <http://www.nytimes.com/2005/05/18/business/18space.html?pagewanted=print>]

International objections aside, Randy Correll, an Air Force veteran and military consultant, told the council, "the big problem now is it's too expensive." The Air Force does not put a price tag on space superiority. Published studies by leading weapons scientists, physicists and engineers say the cost of a space-based system that could defend the nation against an attack by a handful of missiles could be anywhere from $220 billion to $1 trillion. Richard Garwin, widely regarded as a dean of American weapons science, and three colleagues wrote in the March issue of IEEE Spectrum, the professional journal of electric engineering, that "a space-based laser would cost $100 million per target, compared with $600,000 for a Tomahawk missile."

## NASA does the plan- General

### NASA will take on any new project- part of the US mentality towards space. Obama, 10 (“REMARKS BY THE PRESIDENT ON SPACE EXPLORATION IN THE 21ST CENTURY”, Speech given at the John F. Kennedy Space Center, Merritt Island, Florida, April 15th, 2010, Access Date\_7/22/11).

Here at the Kennedy Space Center we are surrounded by monuments and milestones of those contributions. It was from here that NASA launched the missions of Mercury and Gemini and Apollo. It was from here that Space Shuttle Discovery, piloted by Charlie Bolden, carried the Hubble Telescope into orbit, allowing us to plumb the deepest recesses of our galaxy. And I should point out, by the way, that in my private office just off the Oval, I’ve got the picture of Jupiter from the Hubble. So thank you, Charlie, for helping to decorate my office. (Laughter.) It was from here that men and women, propelled by sheer nerve and talent, set about pushing the boundaries of humanity’s reach. That’s the story of NASA. And it’s a story that started a little more than half a century ago, far from the Space Coast, in a remote and desolate region of what is now called Kazakhstan. Because it was from there that the Soviet Union launched Sputnik, the first artificial satellite to orbit the Earth, which was little more than a few pieces of metal with a transmitter and a battery strapped to the top of a missile. But the world was stunned. Americans were dumbfounded. The Soviets, it was perceived, had taken the lead in a race for which we were not yet fully prepared. But we caught up very quick. President Eisenhower signed legislation to create NASA and to invest in science and math education, from grade school to graduate school. In 1961, President Kennedy boldly declared before a joint session of Congress that the United States would send a man to the Moon and return him safely to the Earth within the decade. And as a nation, we set about meeting that goal, reaping rewards that have in the decades since touched every facet of our lives. NASA was at the forefront. Many gave their careers to the effort. And some have given far more. In the years that have followed, the space race inspired a generation of scientists and innovators, including, I’m sure, many of you. It’s contributed to immeasurable technological advances that have improved our health and well-being, from satellite navigation to water purification, from aerospace manufacturing to medical imaging. Although, I have to say, during a meeting right before I came out on stage somebody said, you know, it’s more than just Tang -- and I had to point out I actually really like Tang. (Laughter.) I thought that was very cool.

### NASA’s main objective- to explore and expand in space- will do the plan. Kawamoto, 11 (Jason, “NASA's Three Primary Objectives”, May 13th, 2011, Access Date\_7/22/11).

The National Aeronautics and Space Administration, or NASA, was founded in 1958. Since that time, NASA has developed an unparalleled space program. The agency has made strides in science, technology and space exploration. In 2009, President Obama ordered three new objectives for NASA. The objectives, one in particular, seemed to divert from NASA's original mission -- to explore space.

### NASA will do the plan- key to US international image. Kawamoto, 11 (Jason, “NASA's Three Primary Objectives”, May 13th, 2011, Access Date\_7/22/11).

When Charles Bolden became the NASA administrator in 2009, President Obama ordered him to pursue three new objectives for the nation's space agency: to "reinspire children" to study science and math, to "expand our [U.S.] international relationships" and to "reach out to the Muslim world." According to Bolden, these orders mean NASA aims to be more than just a space exploration agency -- it aims to be, as Bolden put it, "an earth improvement agency."

### NASA will do the plan- key to education system . Kawamoto, 11 (Jason, “NASA's Three Primary Objectives”, May 13th, 2011, Access Date\_7/22/11).

In order to ensure the the next generation of Americans can fulfill NASA's roles and responsibilities, it is important that the nation devote itself to educating children in science and mathematics. This objective will help NASA continue to invest in the nation's education programs. NASA has several education programs that it offers elementary and high school students.

### NASA will do plan- key to international relations. Kawamoto, 11 (Jason, “NASA's Three Primary Objectives”, May 13th, 2011, Access Date\_7/22/11).

President Obama wants to expand the nation's relationships with other countries to be able to engage with the best scientists and engineers in the world. NASA has been engaging with many countries for some years now; the most notable output has been the International Space Station. Bolden has often spoke of the need for greater international cooperation in space exploration and acknowledged that "no single nation is going to go to a place like Mars alone" -- to underscore the need for assistance from abroad.

### NASA will do plan- key to relations with the Muslim world. Kawamoto, 11 (Jason, “NASA's Three Primary Objectives”, May 13th, 2011, Access Date\_7/22/11).

Bolden has stated that improving relations with the Muslim world is his foremost objective. Bolden strongly believes that having better interaction with the Muslim world will ultimately advance space travel. The NASA administrator explains that space travel is an international collaboration that the Muslim nations must be a part of.

## NASA does the plan- Moon

### NASA wants to colonize the moon. NASA, 08 (“Why Go Back to the Moon?, January 14th, 2008, Access Date\_7/22/11).

Taking the Los Angeles Times title, "Don’t colonize the Moon," at face value, I will first point out that the Vision for Space Exploration proposes an "outpost" on the Moon. This is hardly colonization in the sense that Europeans colonized North America. Current NASA plans are in a preliminary stage, but envisage something comparable to Little America, or the Amundsen-Scott South Pole base. These terrestrial examples – operated by humans, incidentally – have proven their scientific value over and over, helping to produce valuable evidence about the ozone hole and global warming.

### NASA making developments to colonize the moon. Kimball, 08 (Harry, “Colonize the Moon? NASA to Scope It Out”, June 13th, 2009, Access Date\_7/22/11).

NASA will launch a mission Wednesday to gather information about how humans might someday colonize the moon, the Los Angeles Times reports. A robotic orbiter will provide detailed maps of the topography and first-of-their kind peeks inside craters where ice might be hiding. “We're going to provide NASA with what is needed to get human beings back to the moon and to stay there for an extended duration,” said one mission official. A second spacecraft will punch a giant crater in the moon so scientists can poke around the resulting plume, again in a hunt for frozen water. “This should be spectacular,” said a project scientist. “It should be a very visible impact from Earth” for amateur astronomers. That comes in about 4 months. The new topographical maps will help determine where the crater goes.

# \*\*\*Earth Sciences

## Uniqueness

### NASA’s budget is currently focused on earth science

Bhattacharjee 3/4 [Yudhijit – staff writer at ScienceInsider since 2003. “Bolden Defends NASA’s Earth Science Missions”. March 4, 2011 ayc http://news.sciencemag.org/scienceinsider/2011/03/bolden-defends-nasas-earth-scien.html]

NASA wants $1.8 billion for earth science in next year's budget, up 25% from current spending levels. Among other things, the agency plans to use that money to ready the Orbiting Carbon Observatory-2 for launch in 2013 and to begin the development of two missions to measure soil moisture and monitor ice sheets and forest cover.

### Obama prioritizing NASA programs now- Even after the budget cuts

Harwood, 2/14 [William Hardwood, NASA correspondent for Cnet news, “NASA 2012 budget reflects 'tough choices,' uncertain outlook,” February 14, 2011, <http://news.cnet.com/8301-19514_3-20031912-239.html>, DA 7/23/11]//RS

Faced with reduced funding and an uncertain outlook, NASA's $18.7 billion fiscal 2012 budget prioritizes the Obama administration's major goals and objectives, focusing on maintaining the International Space Station, retiring the shuttle and ramping up efforts to spur development of commercial manned spacecraft. The budget also reflects the administration's commitment to building a new heavy-lift rocket and a crew capsule that could be used for deep-space exploration. But the budget follows the administration's proposal to freeze federal funding at 2010 levels for the next five years, resulting in a $276 million decrease for NASA compared to the agency's 2011 budget. NASA Administrator Charles Bolden outlines the agency's fiscal 2012 budget request during a news conference in Washington. (Credit: NASA) Until Congress weighs in with actual funding, it's not clear when a viable United States manned spacecraft will emerge to service the station or when eventual deep-space missions might occur. In the meantime, with the shuttle's retirement looming after a final three missions, NASA will continue to rely on Russia to provide transportation to and from the space station aboard Soyuz spacecraft at about $55 million a seat. "This budget requires us to live within our means so we can invest in our future," NASA Administrator Charlie Bolden told reporters. "It maintains our strong commitment to human spaceflight and new technologies. It establishes critical priorities and invests in excellent science, aeronautics research and education programs that will help us win the future." Because "these are tough fiscal times, tough choices had to be made," he said. "Our No. 1 priority is safely flying out the shuttle and maintaining the safety and well being of the American astronauts currently living and working in space."

## Turns the Case

### Budget Cuts snowball – turns the case

Brady, 9 [Kyle Brady; “The Decimation of a Generation’s Future,” Daily Kos, <http://colonialserf.blogspot.com/2009/06/decimation-of-generations-future.html>, DA 7/24/11]//RS

Programs are going to be cut, funding to states lessened, and our dreams shattered, since all of history shows us the lawmakers will protect themselves and their interests first, and be concerned about the general welfare of the population at a later point. NASA, the ultimate embodiment of American frontierism, is already on the chopping block, with massive budget cuts and restrictions likely coming down the pipe – despite being a crucial part of our future, both in terms of space exploration and technological innovation. And it will likely be a vicious cycle. Funding cuts results in less interest and progress, creating less gains in a given area, which, in turn, will result in more funding cuts.

## Ext- trades off with Earth Sciences

### NASA’s money for climate monitoring will go to manned space exploration

Svitak 3/17 [March 17, 2011, Amy Svitak – writer for Space News. “GOP Members Seek Earth Science Cuts.” ayc]

WASHINGTON — Two Republican lawmakers appealed to House Budget Committee Chairman Rep. Paul Ryan (R-Wis.) to spare NASA’s manned space exploration programs from the budget axe next year while suggesting the agency’s roughly $1.6 billion request for climate-monitoring initiatives is ripe for cuts.

### Earth science and space missions will tradeoff.

Foust 11 [Jeff - aerospace analyst, journalist and publisher. He is the editor and publisher of The Space Review and has written for Astronomy Now and The New Atlantis. He has a bachelor's degree in geophysics from the California Institute of Technology and a Ph.D in planetary sciences from the Massachusetts Institute of Technology, Feb. 9, 2011, “Human spaceflight versus Earth sciences?” http://www.spacepolitics.com/2011/02/09/human-spaceflight-versus-earth-sciences/]

A letter signed by several members of Congress is the latest evidence that a new battle line is forming over NASA funding: human spaceflight versus Earth sciences. In a letter to House Appropriations committee chairman Rep. Hal Rogers and CJS subcommittee chairman Frank Wolf, six Republican members of Congress asked the appropriators to prioritize NASA funding on what they consider to be the agency’s primary mission, human spaceflight. To do that, they argue that funding for NASA’s climate change research be redirected to human spaceflight accounts. “With your help, we can reorient NASA’s mission back toward human spaceflight by reducing funding for climate change research and reallocating those funds to NASA’s human spaceflight accounts, all while moving overall discretionary spending towards FY2008 levels,” the letter’s authors—Reps. Bill Posey (R-FL), Pete Olson (R-TX), Rob Bishop (R-UT), Jason Chaffetz (R-UT), Sandy Adams (R-FL), and Mo Brooks (R-AL)—argue.

### Lawmakers want to cut NASA’s climate research to fund manned space flights

Dondero 2/11 [Eric. “Republicans want cuts in NASA budget and shifts away from Politically Correct programs” February 11, 2011 ayc http://www.libertarianrepublican.net/2011/02/republicans-want-cuts-in-nasa-budget.html]

Florida Space Coast Rep. Posey says shift focus backed to manned Space Flights The Obama administration early on shifted priorities for NASA away from manned space exploration, and technology research to global warming and educational outreach to Muslim nations. Now, Republicans are suggesting both budget cuts and a shift back to original priorities for the Space Agency. From Florida.com "NASA: Unclear mission wasteful" Feb. 10: Obama, who will release his proposed fiscal 2012 budget Monday, wants to increase NASA's budget by $6 billion over five years. But Congress has held funding flat so far this fiscal year, and Republicans are searching for cuts. Wolf and Rep. John Culberson, R-Texas, suggested giving NASA responsibility for satellites now managed by the National Oceanographic and Atmospheric Administration. "We're going to have to think about consolidating all sorts of things," Culberson said. **Some lawmakers, including Republican Reps. Bill Posey of Rockledge and Sandy Adams of Orlando, want to shift NASA money away from climate research**. Members of the Appropriations subcommittee said NASA should focus on human spaceflight and robotics. "We've been concerned about the administration's hostility toward manned spaceflight," [Republican Rep. Frank] Wolf said.

## Ext- Solves Climate

### Re-allocating NASA’s earth science money destroys the program

Bhattacharjee 3/4 [Yudhijit – staff writer at ScienceInsider since 2003. “Bolden Defends NASA’s Earth Science Missions”. March 4, 2011 ayc http://news.sciencemag.org/scienceinsider/2011/03/bolden-defends-nasas-earth-scien.html]

"Everything we do in earth science is unique to NASA," Bolden replied, emphasizing that looking down on Earth from space to understand our planet better was very much a part of NASA's job. And shifting NASA's earth science programs to other agencies would amount to getting rid of them entirely, he said. He pointed out that a 2009 study by the U.S. Government Accountability Office had found no duplication of efforts between NASA and NOAA.

### NASA’s Climate monitoring systems are key to determining global warming and water levels

AerospaceTechnology 10 [http://www.aerospace-technology.com/features/feature78185/ “Nasa’s High-Tech Climate Monitoring” April 6, 2010.]

Nasa and climate satellites share a common history. Even as the fledgling organisation was struggling with the early frustrations of its initial manned space flight programme, a Juno II rocket successfully launched Explorer 7 into low Earth orbit and ushered in the era of satellite climate monitoring. The date was 13 October 1959 and Nasa was little more than a year old. Fast-forward to the organisation's 50th anniversary on 29 July 2008 and the Earth-observing constellation had grown to 21-strong. Unsurprisingly, it is not only the numbers that have changed over the intervening half-century. The climate-monitoring element in that first payload simply consisted of a flat-plate radiometer to quantify the heat reaching and leaving the Earth. Today, satellites employ multisensor arrays to monitor everything from glacial ice to the planetary water cycle. However, while the technologies may have been transformed almost beyond recognition in their sophistication, the logic behind satellite-based research remains exactly the same – though many would argue that the need for it is now greater than ever. It is as simple as it is compelling. Before the satellite era, climatologists could only look upward, limiting any attempt to gather data on the middle or upper atmosphere, and largely restricting world-scale understanding to a compendium of discrete, localised observations. With satellites, the whole thing went global. A global picture Achieving the kind of worldwide overview required to meet the needs of increasingly complex climate models inevitably requires cutting-edge technologies across a wide spectrum of sectors, aside from the obvious aerospace demands implicit in the spacecraft themselves. The instruments on Nasa's Aqua satellite - part of a huge mission instigated to elucidate the intricacies of the Earth's water cycle – reads like a checklist of state-of-the-art monitoring devices. The technology includes atmospheric infrared sounding, advanced microwave sounding and scanning radiometry units, and moderate-resolution imaging spectro-radiometry. Aqua and its fellow Earth observation satellites have come a long way since the pioneering days of Explorer 7. The technology has grown, but then so has the task asked of it. The net result has been to provide today's climate scientists with access to an unprecedented global picture, replete with levels of detail that would have been almost unimaginable to the likes of professor Verner Suomi – the meteorologist behind that first flat-plate radiometer. While Aqua has been examining the inter-relationships of oceanic evaporation, atmospheric water vapour, clouds, precipitation, soil moisture, ice and snow, other missions have been inexorably adding to our understanding of Earth's changing climate. From CloudSat and Calipso, for instance, come near-simultaneous 3D measurements of cloud structure, from Aura, details of the composition, chemistry and dynamics of the atmosphere and from the aptly-named IceSat, data on the size and thickness of ice sheets. Still more investigate rainfall, wind, ocean flows and solar radiation. If all goes according to plan, 2010 will add another two satellite and 2013, a third – and all three are set to push the climate monitoring envelope even further. Aquarius and Glory Currently scheduled for launch on 22 November 2010, Glory will explore the Earth's energy balance and the effect it has on the climate. Established in a low orbit, the satellite has two main goals. Firstly, to collect information on "black carbon", and other atmospheric aerosols, in order to complement existing knowledge of the seasonal variability in their properties. Secondly, it will amass data on solar irradiance to contribute to studies of long-term climate shift. These tasks are potentially enormously significant, since they could go a long way to answering question as to whether temperature increase and climate changes are largely anthropogenic, or merely the consequences of natural events. Aquarius, also due to launch in 2010, will pioneer the observation of sea surface salinity from space, closing a notable gap in climatologists' current understanding by gathering more data in two months than has been collected by conventional means over the last 100 years. Capable of a detection accuracy of 0.2psu – equivalent to a pinch of salt in a gallon of water, according to Nasa – the satellite will extend the boundaries of our knowledge of oceanic circulation and the global water cycle, enabling more comprehensive climate models to be developed. The next generation Most of the world's water is contained in the oceans; only 3% is freshwater and two-thirds of that is in the form of permanent ice. That 1% which is available, however, forms a vitally important component of the Earth's hydrological cycle – socio-economically as much as bio-climatically – and precipitation represents one of its most critical elements. "The only practical way to quantify rain, snow and ice fall is to do it from space." It is easy to see why. The world's population has doubled since 1950 – and water use has tripled as a result. With an estimated one billion people already denied access to clean potable supplies, and against a backdrop of changing climate and burgeoning demand, the future availability of freshwater is clearly of massive social importance. It also has ramifications for virtually every other environmental issue too. Without an accurate measurement of the global distribution and intensity of precipitation, climate study lacks one of its most crucial factors, yet quantifying rain, snow and ice fall arguably remains the biggest challenge facing Earth science. The only practical way to do it is from space. Nasa's global precipitation measurement (GPM) mission, scheduled for launch sometime in 2013, arose in response. The satellite will carry a conically-scanning radiometer and dual-frequency cross-track scanning radar and provide the calibration standard for other members of the GPM constellation. The overarching scope of the mission should lead to a better understanding of the role of precipitation within the global system and help examine the wider context of natural and human-induced climate change

### Trades Off threaten satellites that track Natural Disasters and Global Warming

West 06[Larry - a professional writer and editor who has written many articles about environmental issues for leading newspapers, magazines and online publications. “Budget Cuts and Mismanagement Place Environmental Satellites at Risk,” http://environment.about.com/b/2006/03/06/budget-cuts-and-mismanagement-place-environmental-satellites-at-risk.htm, 3/6/2006]

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

### NASA is key to keeping global warming in check

Lewis, Ladislaw, and Zheng 10 [Lewis - senior fellow and director of the Technology and Public Policy Program at CSIS. Sarah O. - senior fellow in the Energy and National Security Program at CSIS Denise E. Zheng , June 2010, “ Earth Observation for Climate Change,” <http://csis.org/files/publication/100608_Lewis_EarthObservation_WEB.pdf>]

Until this year, America’s civil space policies—and the budgets that derive from it—were shaped to a considerable degree by the political imperatives of the past and by the romantic fiction of spaceflight. We believe there is a new imperative—climate change—that should take precedence in our national plans for space and that the goal for space spending in the next decade should be to create a robust and adequate Earth observation architecture**. There is unequivocal evidence, despite careless mistakes and noisy protests, that Earth’s climate is warming**. While the effects and implications of this are subject to speculation, there should be no doubt that the world faces a major challenge. There are important shortfalls in data and analysis needed to manage this challenge. Inadequate data mean that we cannot determine the scope or nature of change in some key areas, such as the melting of Antarctic sea ice. Long-term changes in daily temperature are not adequately understood, in part because of limited observations of atmospheric changes. Our understanding of how some anthropogenic (man-made) influences affect climate change is still incomplete. 1 These shortfalls must be remedied, if only to overcome skepticism and doubt. Climate change now occupies a central place on the global political agenda, and the United States should adjust its space policies to reflect this. Assessing and managing climate change will require taking what has largely been a scientific enterprise and “operationalizing” it. Operationalization means creating processes to provide the data and analysis that governments will need if they are to implement policies and regulations to soften the effects of climate change. Operationalization requires the right kind of data and adequate tools for collecting, analyzing, and disseminating that data in ways that inform decisionmaking at many levels of society**. Satellites play a central role in assessing climate change because they can provide a consistent global view, important data, and an understanding of change in important but remote areas**. Yet there are relatively few climate satellites—a total of 19, many of which are well past their expected service life. Accidents or failures would expose the fragility of the Earth observation system. 2 We lack the required sensors and instruments for the kinds of measurement that would make predictions more accurate and solutions more acceptable. Weather satellites, which take low-resolution pictures of clouds, forests, and ice caps, are not adequate to the task. **NASA builds impressive Earth observation satellites for climate change**, but these have been experimental rather than ongoing programs.

## Disease Scenario Impact Shell

### NASA’s satellites can solve public disease

Stone 07 [Andrea – writer for USA Today. “Earthbound mission for NASA: Public Health”. http://www.usatoday.com/tech/science/space/2007-12-11-nasa\_N.htm 12/12/07 ayc]

From an orbit hundreds of miles above Earth, NASA's constellation of climate-research satellites may not be able to spot a flea in the desert Southwest. But a program that uses space observations to pinpoint the habitats of rodents carrying plagueinfected fleas could warn of disease outbreaks in vulnerable areas of New Mexico. Run by NASA's Applied Sciences Program, the fastdeveloping tool is mining vegetation, rainfall, temperature and topography data from 14 climatemonitoring satellites to predict and prevent outbreaks of infectious diseases. The focus is on "vector-borne" diseases spread by rodents, mosquitoes, fleas and ticks. By monitoring climate, precipitation and ground-cover changes that encourage these creatures to thrive, scientists can offer early warnings about potential outbreaks of diseases such as malaria, West Nile virus and bubonic plague. "This is a huge breakthrough revolution in the field of public health," says program manager John Haynes, who unveiled NASA's infectious-disease-finding abilities for doctors attending the American Society of Tropical Medicine and Hygiene meeting in Philadelphia last month. Satellites have been used to predict the weather since 1960. Their use in making public-health decisions is only about a decade old. "There's been a paradigm shift," Haynes says. NASA is reaching out to "front-line troops who are our nation's health defense." Information from the remote sensors is being shared with the federal Centers for Disease Control and Prevention, the Defense Department, state health agencies, the World Health Organization and foreign governments. Unlike surveys of patients, which are prone to human error, satellite data "provides a reliable tool for public health that … is not confounded by other factors," says Teresa Fryberger, NASA's Applied Sciences Earth Science Division director. Among the diseases targeted: Malaria A parasitic disease spread by mosquitoes in tropical climates, malaria is a top concern for military planners. In 2003, one-third of U.S. personnel involved in a peacekeeping mission in Liberia came down with the disease. By combining ground observations with satellite measures of temperature, rainfall, ground-cover density and soil moisture, NASA and military researchers in Thailand and Indonesia have identified hot spots. Maj. Jittawadee Murphy of the Armed Forces Research Institute of Medical Sciences in Bangkok says in an e-mail: "Each species of mosquitoes prefers different and unique habitat to breed. Therefore we're able to estimate mosquito populations in each terrain, predict disease cases at particular time(s) of the year, and conduct research studies for disease control and prevention at the right place and the right time." Murphy also said scientists use NASA data to predict outbreaks of scrub typhus, a sometimes fatal disease endemic to Southeast Asia, by locating habitats of chigger mites that spread it. West Nile virus NASA's Terrestrial Observation & Prediction System combines satellite imagery and ground-station data to collect, integrate and analyze in nearly real time 30 environmental factors that could contribute to the mosquito-borne disease. William Reisen, a research entomologist at the Center for Vectorborne Diseases at the University of California-Davis, is lead scientist on a project. He shares data with state public health officials and 63 mosquito-control districts. "If we could forecast where and when" virus-infected insects would swarm, crews "could adjust their control operations to reduce mosquito abundance and have things in place" before people fall ill, he says. Bubonic plague Endemic to the western USA, especially the Four Corners region of the Southwest (the meeting point of Utah, Colorado, Arizona, and New Mexico), bubonic plague spread by rats and their fleas sickens 10 to 20 people a year. Because rats tend to breed in canyons, NASA combines topographical data with predictions of rodent food supply and migration patterns to predict the location of outbreaks. It shares the information with the CDC. Early warning is crucial, because the plague's flulike symptoms can lead to misdiagnoses that could prove fatal if antibiotics aren't administered promptly. NASA satellites also can help distinguish between a naturally caused outbreak and one that might result from bioterrorism. When an outbreak of Rift Valley Fever killed more than 120 people in Saudi Arabia and Yemen in 2000, U.S. military commanders worried it might have been caused by the release of the fever-causing virus by a terrorist cell. Using rainfall data from NASA's Tropical Rainfall Measuring Mission satellite and vegetation measurements from the Terra and Aqua satellites, scientists discovered "the heaviest rainfall in that area than they'd had in 30 years." The rain boosted the mosquito population, so "with extremely high likelihood, we determined it was naturally caused," Haynes says. NASA plans seven more global climate science satellites by 2013, which should expand the number of infectious diseases it can monitor. One candidate is avian flu, which is spread by waterfowl. The U.S. Agency for International Development already finances programs to tag migratory birds with GPS satellite transmitters to monitor their movement and match their paths with disease outbreaks. "It's up to us at NASA to use our research ability to determine if there are any environmental observations (that can shed light on) the transmission of this disease," Haynes says.

### Diseases will cause extinction

Fox 97 [LTC C. William, Jr., M.D., external researcher and Commander of Bayne-Jones Army Hospital, PARAMETERS, U.S. Army War College Quarterly, Vol. XXVII, No. 4, Winter 1997-98, p. 121–36, “Phantom Warriors: Disease as a Threat to US National Security”, http://www.carlisle.army.mil/usawc/Parameters/97winter/fox.htm]

It is difficult to overstate the effects of disease on life in Africa. Of all the world's populations, Africans have the least chance of survival to the age of five. After that age, diseases and the effects of poor diets and other health threats in the environment begin to take a serious toll. If fortunate enough to make it to adulthood, Africans are the least likely of the world's peoples to live beyond the age of 50. The diseases to be discussed are among the primary reasons for this depressing statistic. They also pose a potential threat to US national security. HIV is a pandemic killer without a cure, and viruses such as Ebola-Zaire are merely a plane ride away from the population centers of the developed world. Viruses like Ebola, which are endemic to Africa, have the potential to inflict morbidity and mortality on a scale not seen in the world since the Black Plague epidemics of medieval Europe, which killed a quarter of Europe's population in the 13th and 14th centuries. **These diseases are not merely African problems; they present real threats to mankind**. They should be taken every bit as seriously as the concern for deliberate use of weapons of mass destruction.

## Ext- Solves Disease

### NASA satellites can track and predict the spread of cholera

Peeples 7/6 [Lynne – writer for the Huffington Post. “Satellite Images May Help Predict The Next Cholera Outbreak” July 6, 2011 ayc http://www.huffingtonpost.com/2011/07/06/cholera-outbreak-prediction-prevention\_n\_891756.html]

As cholera continues to ravage parts of Sub-Saharan Africa, South Asia and Latin America -- reportedly reaching Puerto Rico and Hong Kong this week **-- public health researchers are looking to the skies in hopes of anticipating future outbreaks. Satellite images of the oceans, researchers say, could soon forecast where and when cholera is most likely to strike. C**ertain developing countries, such as Bangladesh and Mozambique, already know to expect the unwelcome visitor almost every year and typically have measures in place to minimize its impact. Cholera's recent arrival in Haiti and Pakistan, however, caught the nations by surprise. It had been a century since either faced an outbreak of the disease, which causes severe diarrhea and a 50 percent chance of death due to dehydration if not treated quickly. According to Shafiqul Islam, an expert in environmental engineering and water diplomacy at Tufts University in Medford, Mass., this left the Haitian people vulnerable and their health officials unprepared. Over 6 percent of Haitians initially infected succumbed to cholera, compared to just 0.1 percent of victims in Bangladesh. "That's amazing, and extremely troubling," said Islam, highlighting the similarly poor economic conditions in the two nations and the fact that cholera has such an easy and cheap cure: clean water with some sugar and salt. If Haiti had been warned a couple of months in advance to prepare large quantities of this simple solution, along with other treatments and vaccines, it might have been a different story, Islam said. Ever since John Snow first identified cholera in London 150 years ago, researchers have focused primarily on understanding the microbiology of the bacteria, Vibrio cholera, and how to help the human body combat it. Despite substantial progress made on this front, the disease continues to be a global threat, affecting 3 to 5 million people annually and killing more than 100,000 of its victims, according to the World Health Organization. Experts don't expect it to go away any time soon. But if science takes a step back to evaluate the timing and places that can set the stage for a cholera epidemic, suggested Islam, we might better coexist with the stubborn strains. "If you can use this information to make a prediction, then you can mobilize the necessary resources," he said. In a study published in the the May issue of Water Resources Research, Islam and his colleagues describe how large-scale environmental conditions can be conducive to the initiation, transmission and propagation of cholera. The team looked at data from Bengal Delta in Bangladesh, identifying two annual peaks for cholera cases: one in the spring and one in the fall. The first peak appeared to be triggered by a "low flow," in which long-term drought conditions resulted in a mix of salt and fresh water off the Bangladesh coast. Cholera thrives in such brackish conditions, where it hitches rides on tiny marine mammals called zooplankton. These hosts can multiply rapidly over a period of a couple of months -- especially when stimulated by an algal bloom -- and eventually introduce cholera to coastal cities via seafood or drinking water. A few months later, just as an affected region is sighing a breath of relief for a waning outbreak, the heavy rains and flooding of monsoon season can revive and spread cholera bacteria inland. This second peak is most common in regions with poor water and sewer systems. (A total of 44 cases of cholera have been reported in the U.S. over the last five years, but good water infrastructure continues to keep the disease in check.) Although the timing and number of peaks can vary between regions, the components that lead to a cholera outbreak can likely be generalized beyond Bangladesh, suggested Islam. **NASA satellites could identify the chlorophyll abundant in phytoplankton within the Earth's oceans, he explained. Since zooplankton feed on phytoplankton and also carry the toxic bacteria, satellites could be used to develop prediction models that forecast cholera outbreaks two to three months in advance**. "If you want to make predictions, three days or even three weeks in advance is not enough," said Islam. "You need at least two to three months in order to warn the public and allow professionals enough time to get ready." **Satellite monitoring could be even more crucial in the years ahead as current climate models point to both increased drought and severe flooding.** "If these models are correct," said Islam, "then cholera will get more intense." A separate study published in the June issue of the American Journal of Tropical Medicine and Hygiene linked a 1 degree Celsius (1.8 degrees Fahrenheit) rise in the average monthly minimum temperature to a doubling in the number of cholera cases within four months in Zanzibar, Tanzania. A substantial increase in cases was also seen two months after a 200-millimeter (7.9-inch) rise in monthly rainfall. Downpours may not only affect the spread of the disease, but could also help initiate its growth. "In general, warmer sea surface temperatures and a warmer atmosphere lead to increasingly frequent and heavy rain," said Dr. Paul Epstein, associate director of the Center for Health and Global Environment at Harvard Medical School. "These intense rains can flush nutrients, organisms and chemicals into coastal marine habitat and trigger an algal bloom." Non-environmental factors may play a role, too. A catastrophic earthquake hit Haiti in January 2010, damaging already poor sanitary systems. That, along with the possible introduction of the bacteria by United Nations peacekeepers, are hypothesized to have played a significant role in the country's outbreak, which first manifested in October. But Islam doesn't think those factors tell the whole story. A very large earthquake struck Pakistan in 2005, and cholera was not one of the consequences. Meanwhile, when floods struck the same country this year, a massive cholera outbreak did result. "The right environmental conditions must be present for the disease to spread," explained Islam. Once a cholera outbreak is predicted for a region, he added, "a multi-pronged approach" should be initiated. It's not feasible to vaccinate everyone given the $10-to-$15 price tag and limited production. What's more, a dose is only effective for one or two seasons. Antibiotics can help in the fight, noted Epstein, but he highlighted the greater importance of stocking up on clean water, salt and sugar. Other preparations include protecting and treating the water supply -- often a more long-term solution requiring improvements in the division between water and sewer infrastructure. Of course, it takes time for any measures to be mobilized. And once the first cases appear, it's often too late. Fortunately, cholera is particularly "amenable to early warning," noted Epstein. Over the next several years, Islam expects that potential to be realized with the widespread use of satellite-based prediction. "We hope this will change the game," he said

### Disease can cause extinction – scientific studies prove “hyperdisease conditions”

Viegas 08 [Jennifer – writer for Discovery News and MSNBC. “How disease can wipe out an entire species” http://www.msnbc.msn.com/id/27556747/ns/technology\_and\_science-science/t/how-disease-can-wipe-out-entire-species/ 11/5/2008 ayc]

Disease can wipe out an entire species, reveals a new study on rats native to Australia's Christmas Island that fell prey to "hyperdisease conditions" caused by a pathogen that led to the rodents' extinction. The study, published in the latest issue of the journal PLoS One, presents the first evidence for extinction of an animal entirely because of disease. **The researchers say it's possible for any animal species, including humans, to die out in a similar fashion**, although a complete eradication of Homo sapiens would be unlikely. "I can certainly imagine local population or even citywide 'extinction,' or population crashes due to introduced pathogens under a condition where you have a pathogen that can spread like the flu and has the pathogenicity of the 1918 flu or Ebola viruses," co-author Alex Greenwood, assistant professor of biological sciences at Old Dominion University in Norfolk, Va., told Discovery News. The 1918 flu killed millions of people, while Ebola outbreaks have helped to push gorillas close to extinction. For the Christmas Island study, Greenwood and his colleagues collected DNA samples from the island's now-extinct native rats, Rattus macleari and R. nativitatis, from museum-housed remains dating to both before and after the extinction event, which occurred between 1899 and 1908. Co-author Ross MacPhee, a curator of vertebrate zoology at the American Museum of Natural History in New York, N.Y., explained that Charles Andrews of the British Museum documented at the time that black rats were first brought to the island via the S.S. Hindustan in 1899. The ship-jumping black rats then carried a protozoan known as Trypanosoma lewisi. A related organism causes sleeping sickness in humans. "Fleas are the intermediate host for one of the developmental stages of Trypanosoma, and the only likely method (of disease spread) is infected fleas crossing from black rats to endemic rats," MacPhee told Discovery News. After the Hindustan's arrival, the native island rats were observed staggering around deathly "The general explanation for islander susceptibility would presumably be that island denizens live in a sort of bubble, protected by water barriers from diseases prevalent on mainlands or elsewhere," MacPhee explained. "But when the bubble is broken -- think measles epidemics in Iceland in the 19th century -- the mortality can be extreme." Karen Lips, associate professor of zoology at Southern Illinois University, told Discovery News that the new research was "well done and convincing, despite the limited number of samples available." She also pointed out that island-like conditions exist within mainland areas. "I work up on mountaintops, another kind of island with high endemism, which is greatly affected by emerging infectious disease," she said. Elk in North America, for example, have suffered worrisome population losses due to wasting diseases induced by prions. Various South Pacific fruit bats and amphibians are also under threat now due to infectious diseases. "What can be done?" asked MacPhee. "Probably nothing other than captive conservation," he added. "Most wildlife biologists are hoping that such diseases, although severe, will eventually accommodate and the species will pull through." ill on footpaths. Shortly thereafter, they were never seen again. The museum DNA samples showed that Christmas Island native rodents collected before the black rats invaded the island were not infected with the protozoan, but six out of 18 collected post-contact were infected. Eight great extinct species"Not every rat would have to be infected," Greenwood explained. **"If you push a population down to an unsustainable number then it will collapse**. In addition, if a substantial number of reproducing individuals became infected and ill, even if they survived the infection, their reproduction rate may be lowered and lead to a population crash." Given the rats' fate, scientists are concerned about Tasmanian devils, which have been dying in record numbers due to devil facial tumor disease, a contagious cancer for which the carnivorous marsupials appear to have no immunity. Such island species seem to be more vulnerable to extinction by disease. In a prior study, MacPhee determined that at least 80 percent of all species-level losses during the past 500 years have occurred on islands.

## Disease Impact

### Disease can cause extinction – scientific studies prove “hyperdisease conditions”

Viegas 08 [Jennifer – writer for Discovery News and MSNBC. “How disease can wipe out an entire species” http://www.msnbc.msn.com/id/27556747/ns/technology\_and\_science-science/t/how-disease-can-wipe-out-entire-species/ 11/5/2008 ayc]

Disease can wipe out an entire species, reveals a new study on rats native to Australia's Christmas Island that fell prey to "hyperdisease conditions" caused by a pathogen that led to the rodents' extinction. The study, published in the latest issue of the journal PLoS One, presents the first evidence for extinction of an animal entirely because of disease. **The researchers say it's possible for any animal species, including humans, to die out in a similar fashion**, although a complete eradication of Homo sapiens would be unlikely. "I can certainly imagine local population or even citywide 'extinction,' or population crashes due to introduced pathogens under a condition where you have a pathogen that can spread like the flu and has the pathogenicity of the 1918 flu or Ebola viruses," co-author Alex Greenwood, assistant professor of biological sciences at Old Dominion University in Norfolk, Va., told Discovery News. The 1918 flu killed millions of people, while Ebola outbreaks have helped to push gorillas close to extinction. For the Christmas Island study, Greenwood and his colleagues collected DNA samples from the island's now-extinct native rats, Rattus macleari and R. nativitatis, from museum-housed remains dating to both before and after the extinction event, which occurred between 1899 and 1908. Co-author Ross MacPhee, a curator of vertebrate zoology at the American Museum of Natural History in New York, N.Y., explained that Charles Andrews of the British Museum documented at the time that black rats were first brought to the island via the S.S. Hindustan in 1899. The ship-jumping black rats then carried a protozoan known as Trypanosoma lewisi. A related organism causes sleeping sickness in humans. "Fleas are the intermediate host for one of the developmental stages of Trypanosoma, and the only likely method (of disease spread) is infected fleas crossing from black rats to endemic rats," MacPhee told Discovery News. After the Hindustan's arrival, the native island rats were observed staggering around deathly "The general explanation for islander susceptibility would presumably be that island denizens live in a sort of bubble, protected by water barriers from diseases prevalent on mainlands or elsewhere," MacPhee explained. "But when the bubble is broken -- think measles epidemics in Iceland in the 19th century -- the mortality can be extreme." Karen Lips, associate professor of zoology at Southern Illinois University, told Discovery News that the new research was "well done and convincing, despite the limited number of samples available." She also pointed out that island-like conditions exist within mainland areas. "I work up on mountaintops, another kind of island with high endemism, which is greatly affected by emerging infectious disease," she said. Elk in North America, for example, have suffered worrisome population losses due to wasting diseases induced by prions. Various South Pacific fruit bats and amphibians are also under threat now due to infectious diseases. "What can be done?" asked MacPhee. "Probably nothing other than captive conservation," he added. "Most wildlife biologists are hoping that such diseases, although severe, will eventually accommodate and the species will pull through." ill on footpaths. Shortly thereafter, they were never seen again. The museum DNA samples showed that Christmas Island native rodents collected before the black rats invaded the island were not infected with the protozoan, but six out of 18 collected post-contact were infected. Eight great extinct species"Not every rat would have to be infected," Greenwood explained. **"If you push a population down to an unsustainable number then it will collapse**. In addition, if a substantial number of reproducing individuals became infected and ill, even if they survived the infection, their reproduction rate may be lowered and lead to a population crash." Given the rats' fate, scientists are concerned about Tasmanian devils, which have been dying in record numbers due to devil facial tumor disease, a contagious cancer for which the carnivorous marsupials appear to have no immunity. Such island species seem to be more vulnerable to extinction by disease. In a prior study, MacPhee determined that at least 80 percent of all species-level losses during the past 500 years have occurred on islands.

## Solves Conflict

### Climate change risks security, stability, econ; only way to reverse this is with NASA’s climate monitoring

Lewis, Ladislaw, and Zheng 10 [Lewis - senior fellow and director of the Technology and Public Policy Program at CSIS. Sarah O. - senior fellow in the Energy and National Security Program at CSIS Denise E. Zheng , June 2010, “ Earth Observation for Climate Change,” <http://csis.org/files/publication/100608_Lewis_EarthObservation_WEB.pdf>]

Climate change poses a dilemma for space policy. The programs needed to manage climate change have been woefully underfunded for decades. The normal practice is to call uncritically for more money for civil space and its three components—planetary exploration, Earth observation, and manned spaceflight. In fact, civil space has been lavishly funded. Since 1989, NASA has received $385 billion, with $189 billion in the last decade. 3 This is more than the space budgets of most other nations combined. The problem is not a lack of money but how it has been spent. The bulk of this money went to NASA’s manned space program. This is a legacy of the Cold War. Manned spaceflight showed that market democracies could surpass scientific socialism. The point has been made. Spaceflight provides prestige, but a long series of miscalculations have left the United States with a fragile and fabulously expensive space transportation system. It will take years to recover, and some goals, such as a voyage to Mars, are simply unachievable absent major breakthroughs in physics and other sciences. If we accept that climate change poses serious risks to regional stability, national security, and economic health, the United States needs to reconsider its funding priorities for civil space. Earth observation is crucial for national security and the economy; manned spaceflight programs provide prestige. The United States must make climate-monitoring satellites its priority for funding if it is serious about managing climate change. In practical terms, this means a reduction in the spending on human spaceflight in order to fund a sustained program of satellite-building to create a robust climate monitoring space system.This is, of course, not an all-or-nothing issue. The United States can fund a range of space programs, manned and unmanned, for exploration and for Earth sciences. It is a question of priorities. Our recommendation is that the funding given to Earth observation should increase, as it is more important now for the national interest to monitor and manage climate change, even if that means a slower pace for other programs, such as manned spaceflight, until a robust Earth observation system has been put in orbit

# \*\*\*Aeronautics Scenario

## 2NC turns the case

### Aeronautics research is key to the aff.

SSB 06 (Space Studies Board, AN ASSESSMENT OF BALANCE IN NASA’S SCIENCE PROGRAMS, http://www.nap.edu/openbook.php?record\_id=11644&page=3)

Recommendation 3. Every effort should be made to preserve the essential ground-based and flight research that will be required to enable long-duration human spaceflight and to continue to foster a viable community that ultimately will be responsible for producing the essential knowledge required to execute the human spaceflight goals of the Vision for Space Exploration. The scale of the short-term resource allocation required to revive this effort is also modest (less than 1 percent of the total NASA budget), yet addressing that problem will provide a continuing source of knowledge and community commitment that is absolutely critical for the success of this endeavor.

### Cuts to other NASA programs turn the case- we need NASA’s other programs to execute a successful colonization program.

SSB 06 (Space Studies Board, AN ASSESSMENT OF BALANCE IN NASA’S SCIENCE PROGRAMS, http://www.nap.edu/openbook.php?record\_id=11644&page=32)

NASA has rationalized these reductions based on the need to use the funds for the development of the Crew Exploration Vehicle, which is to replace the space shuttle. In many ways, then, the reductions in life and microgravity sciences programs are the most egregious example of the unfortunate choices that NASA has had to make because the overall funding for the agency is inadequate for its many responsibilities. NASA is being compelled to accommodate near-term necessities at the expense of the future of human spaceflight. The committee has serious doubts about whether the necessary research community can be reconstituted rapidly enough later so that it can meet NASA’s needs in time to support critical exploration risk assessments, systems choices, and development.

## Uniqueness Ext

### Funding from cancelling Constellation went to support NASA’s science programs.

Science Insider 10 (Canceled Moon Shot Pays for NASA Science Boost, Feb 2, http://news.sciencemag.org/scienceinsider/2010/02/canceled-moon-s.html)

By canceling NASA’s moon mission, launched by former President George W. Bush in 2004, the White House pays heed to a report delivered last fall by the Norm Augustine commission, which declared that the goal of returning American astronauts to the moon by 2020 was unviable without a major boost to NASA’s budget. Instead, the White House has proposed eliminating the Constellation program, a $3.5-billion-a-year initiative aimed at building rockets, spacecraft, and other systems for the moon mission. Although the moon mission would be zeroed out under the Administration’s proposal, NASA’s overall budget would increase by $6 billion over the next 5 years. It would go from $18.7 billion in 2010 to $19 billion in 2011. NASA officials argue that Constellation’s end marks a major change in the nation’s space policy that could in fact accelerate space exploration by freeing up money for science and the funding of new technologies for future space flight, which would be led by the private sector instead of the government. NASA officials say they will leverage corporate investments and international collaborations to chart a new course in space exploration. That includes putting up money to extend the life of the international space station beyond the current end date of 2015 to at least 2020. The good news for researchers is that the Administration’s proposed funding for science would climb to $5 billion in 2011 from a current level of $4.45 billion, although details on what new programs would be supported have yet to become clear. “The number seems consistent with Obama’s stated commitment to science,” says David Leckrone, former chief scientist of the Hubble Space Telescope, who retired from NASA last fall. He says Charles Bolden, as the new administrator, deserves credit for seeing through an overall increase in the agency’s budget. “I’d have to give him good marks for coming away with a significant increase at a time of severe budgetary constraints,” Leckrone says. “It’s a coup, and I believe that Charlie had a major role in making that happen.”

### NASA focusing on Aeronautics

Levine ’11 (Jay, Xpress editor, “Rising Expectations - Aeronautics a Focus at N.M. Balloon Fiesta”, http://www.nasa.gov/centers/dryden/news/X-Press/balloon\_fiesta.html) JL

Though many people are aware of the agency's space mission, not as many are familiar with NASA's aeronautics research conducted at four centers across the nation: Ames Research Center at Moffett Field, Calif., Dryden Flight Research Center at Edwards, Calif., Glenn Research Center in Cleveland, and Langley Research Center in Hampton, Va. NASA Aeronautics, which has a history of bringing key technologies to all aspects of aviation, is looking to do so again with its latest "green aviation" initiative. The program seeks to test and integrate technologies for reducing aircraft noise and emissions, maximizing fuel usage and improving air-traffic management.

## Trades off with Aeronautics

### NASA’s resources are finite- we cannot commit to exploration and keep doing aeronautical and other research at the same time.

Levinger 10 (Josh, Research Assistant- MIT’s Center for Future Civic Media, Should we cut NASA Funding, 4-9, http://tech.mit.edu/V130/N18/nasacp.html)

Space critics are right about one thing, NASA has been rudderless for the last few years. Though charged by the Bush administration to extend the reach of humanity back to the Moon and on to Mars, it was given no additional funding to do so. The civilian space budget has been effectively capped for the last two decades; all aeronautical, biological, and exploration related research fight for the same pool of money. Saddled with an outdated, underpowered and needlessly winged Space Shuttle, the Constellation project proposed a new launch vehicle that would return us to the glory days. However, it ended up like so many projects, behind schedule and over budget. We simply cannot develop new capability, fly the Shuttle to finish building and continue servicing the space station, and do cutting edge research without expanding the budgetary pool. Something has to go; and so, surprise, the federal government established a committee to study the problem.

## NASA key to Aeronautics- general

### NASA critical to aeronautics.

Watkins et al 06 (Todd, PhD-Harvard and director-Lehigh University’s Institute for Entrepreneurship, Creativity and Innovation, with ALAN SCHRIESHEIM and STEPHEN MERRILL, Glide Path to Irrelevance: Federal Funding for Aeronautics, http://www.issues.org/23.1/watkins.html)

To us, this is stunning neglect of the national interest in the future of aeronautics technologies. At current and proposed funding levels, NASA and the nation cannot hope to come close to fulfilling national needs in the face of an already strained air transportation system; fierce and increasing international competition in aircraft markets; the environmental challenges of noise, emissions, and fuel efficiency; and demands for improved air safety and homeland security. NASA’s ARMD is the nation’s only organizationally and technically capable option for overall leadership in aeronautics technologies. Unfortunately, it is largely hidden from public view, structurally, financially, and politically buried in a space agency on a mission to Mars. How many additional hundreds of millions of delayed air travelers, or how many more national commissions warning about the perilous future of U.S. aeronautics, will it take to get policymakers to put the A back in NASA?

### More ev.

Watkins et al 06 (Todd, PhD-Harvard and director-Lehigh University’s Institute for Entrepreneurship, Creativity and Innovation, with ALAN SCHRIESHEIM and STEPHEN MERRILL, Glide Path to Irrelevance: Federal Funding for Aeronautics, http://www.issues.org/23.1/watkins.html)

National needs fall into four broad areas. The first three involve classic public or quasi-public goods in which there is little disagreement that the federal government should play a central role. These categories are air traffic control, emissions and noise reduction, and air safety and security. In practice, the central federal role falls to NASA. No other organization remotely has the capabilities. Were it not for NASA, little R&D would be performed, key supporting infrastructure would not exist, and new technologies would not be developed because the benefits appropriable by private enterprise are too limited or too widely diffused to attract investment. The fourth category centers on commercial competitiveness. Here, there is much more policy debate about the role of the federal aeronautics enterprise. And the ideological tone of this debate carries over to, and dwarfs and distorts, discussion of the other three areas.

## Colonization Link

### Colonization programs tradeoff with aeronautics research.

Aviation Week 06 (NASA Budget Stretched Too Thin, National Academies Says, May 5, http://www.aviationweek.com/aw/generic/story\_generic.jsp?channel=space&id=news/NASB05056.xml&headline=NASA%20Budget%20Stretched%20Too%20Thin,%20National%20Academies%20Says)

NASA can't accomplish all that is on its plate with its current and projected budgets, and science at the agency is threatened as it bears the brunt, according to a new report from the National Academies' Space Studies Board (SSB). "NASA is being asked to accomplish too much with too little," the May 4 report says. "The agency does not have the necessary resources to carry out the tasks of completing the International Space Station, returning humans to the moon, maintaining vigorous [science] programs, and sustaining capabilities in aeronautical research." NASA plans to cut science by $3.1 billion from 2007 through 2011, as compared to the projections that accompanied the fiscal 2006 NASA budget request, to address a shortfall in the space shuttle's budget as that program attempts to complete the ISS and retire in 2010. The budget request for NASA's science mission directorate in FY '07 is $5.33 billion, and is set to grow at less than the rate of inflation for the next several years, the report says. "We are particularly concerned that the shortfall in funding for science has fallen disproportionately on small missions and on funding for basic research and technology," SSB Chairman Lennard Fisk said in a statement. "These actions run the risk of disrupting the pipeline of human capital and technology that is essential for the future success of the space program."

## I/L Aerospace industry key to Econ

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

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

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

### Aerospace industry key to the already faltering economy.

Watkins, Schriesheim, and Merrill. 2006. (Todd Watkins is associate professor of economics in the College of Business and Economics at Lehigh University, Alan Schriesheim is director emeritus of Argonne National Laboratory, and Stephen Merrill is executive director of the National Academies’ Board on Science, Technology, and Economic Policy. “Glide Path to Irrelevance: Federal Funding for Aeronautics” http://www.issues.org/23.1/watkins.html ) hss

Nonetheless, recent signs that the nation’s preeminence in aviation may be imperiled have occasioned deep concern. At least 12 studies of U.S. activity in aeronautics published during the past half decade by the National Academies and various industry and government bodies have called attention to the vulnerability of the United States’ traditional leading position. In its final report, the Commission on the Future of the United States Aerospace Industry, widely known as the Walker Commission, stated that “the critical underpinnings of this nation’s aerospace industry are showing signs of faltering” and warned bluntly, “We stand dangerously close to squandering the advantage bequeathed to us by prior generations of aerospace leaders.” In 2005, the National Aerospace Institute, in a report commissioned by Congress, declared the center of technical and market leadership to be “shifting outside the United States” to Europe, with a loss of high-paying jobs and intellectual capital to the detriment of the United States’ economic well-being. The clear message is that the United States must overcome a series of major challenges—to the capacity, safety, and security of the nation’s air transportation system, to the nation’s ability to compete in international markets, and to the need to reduce noise and emissions—if the nation’s viability in this sector, let alone international leadership, is to be ensured.

American aerospace is the best internal link to economic growth— jobs and exports
Albaugh, 4/27 [Jim Albaugh, President & CEO, Boeing Commercial Airplanes, Annual Aviation Summit, U.S. Chamber of Commerce, April 27, 2011, “Keeping America’s Lead in Aerospace,” DA 7/30/11]//RS

To me, American aerospace defined the 20 th Century. It helped win World War II. It brought the world closer together with commercial air travel. It changed the way we communicate with commercial satellites. And, of course, it changed forever how we look at the world around us when man first walked on the Moon. I am also convinced that aerospace will define the 21 st century. The question is, will it be U.S. aerospace that does it? That’s a critical question because what we do helps keep America strong. No industry has a bigger impact on exports. It tips the balance of trade in our favor by about $53 billion. President Obama has set the goal of doubling U.S. exports in five years. Aerospace will be essential to help us reach that goal. When you look at direct 1and secondary impacts, it's been estimated that U.S. civil aviation alone is responsible for 12 million jobs and contributes to more than 5 1/2 percent of the US GDP.

US aerospace key to economic growth, hegemony, and international cooperation
Blakey, 7/27 [Ms. Marion C. Blakey, President and CEO Aerospace Industries Association of America, “Statement for the Record: Bureaucratic Obstacles for Small Exporters: Is our National Export Strategy Working?,” July 27, 2011, <http://www.aia-aerospace.org/assets/statement_07272011.pdf>, DA 7/30/11]//RS

The U.S. aerospace industry is second to none. The trade surplus our industry has earned and the hundreds of thousands of jobs it supports will play a critical role in our nation’s economic recovery. Aerospace exports fuel the health of our companies and the competitiveness of the most innovative industrial base in the world. Our nation reaps the benefits of aerospace exports in the form of enhanced national security and economic growth. The government-industry partnership supporting aerospace exports is crucial, and cannot be taken for granted. In the absence of the type of dialogue and collaboration practiced by this committee and its leadership, it is easy to miss opportunities or even damage international cooperation with our friends and allies overseas.

### Strong aerospace key to economic growth, readiness, and building international relationships

Blakey, 7/27 [Ms. Marion C. Blakey, President and CEO Aerospace Industries Association of America, “Statement for the Record: Bureaucratic Obstacles for Small Exporters: Is our National Export Strategy Working?,” July 27, 2011, <http://www.aia-aerospace.org/assets/statement_07272011.pdf>, DA 7/30/11]//RS

Why Do Aerospace Exports Matter? More than a third of the $214.5 billion in U.S. aerospace sales of civil, space, and defense products last year went to overseas customers. In these challenging economic times, it is necessary but not sufficient to highlight that these exports create and sustain high-skill, high-wage jobs. It is equally, if not more critical to recognize that these exports are necessary to sustain and increase the capacity for cutting-edge innovation in the U.S. industrial base. The parts and components used to develop, produce and sustain these systems sold overseas are sourced from thousands of small- and medium-sized companies who use this revenue to invest in their future global competitiveness. We must therefore continue to compete effectively in the international marketplace to expedite our economic recovery and set a future trajectory for even greater economic growth. Exports help AIA members provide the Americans defending our country and guarding our homeland with the best technology at the best price for the U.S. taxpayer. Exports support technology exchange, allowing our industry to leverage foreign innovation to make our own world-class products even better. Exports also lower unit costs for systems and components. In challenging economic times, overseas sales keep critical 2 production lines open and available to meet the threats we face now and will face in the future. Aerospace exports also serve as a foundation for building key relationships and a shared future with important international allies and partners. American aviation products and services are at the forefront of providing to the world safe, reliable and environmentally responsible air travel. Our space industry connects the globe, helping us communicate, navigate and explore with other nations. As the United States asks its allies to take on greater responsibility in a shared effort to protect international security and stability, it is imperative that these key partners be equipped with and trained on the appropriate systems and technologies to ensure engagement and interoperability with U.S. and other coalition forces.

### The Aerospace industry is a key exporter in the US economy and supports over 1 million jobs

US Department of Commerce, 11 [June 21, 2011, “Aerospace Industry is Critical Contributor to U.S. Economy According to Obama Trade Official at Paris Air Show”, <http://trade.gov/press/press-releases/2011/aerospace-industry-critical-contributor-to-us-economy-062111.asp>, DA 7/30/11]//RS

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

## AT: Aerospace’s Retiring Workforce

### Space is key to inspiring the younger generation

Hendin 7/8 [Robert – writer for CBS News, “Could NASA be on the chopping block?” ayc July 8, 2011, http://www.cbsnews.com/8301-503544\_162-20077757-503544.html]

"The impact of our space program is a global phenomenon," said Rubio speaking on the Senate floor today. "**Our space program inspired young generations of Americans to pursue careers in the aerospace industry** and other related fields.Satellite technologies developed and improved by NASA now connect the world in unprecedented ways and support our military reconnaissance missions and facilitate travel through G.P.S. devices. For others, it got them hooked on math and science and let them to other fields whose innovations make our lives better every single day."

## Cyber War Impact

### **Aerospace is key to heg & cyber warfare**

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

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

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

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

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

## Terrorism Impact

First internal link:

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

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

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

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

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

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

Second internal link:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

## Heg Impact

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

Posen, 3 [Barry R. Posen is Professor of Political Science at the Massachusetts Institute of Technology and a member of its Security Studies Program, “Command of the Commons: The Military Foundation of U.S. Hegemony,” International Security, Volume 28, Number 1, Summer 2003, pp. 5-46 (Article), <http://muse.jhu.edu/journals/international_security/v028/28.1posen.html>, DA 7/16/11]//RS

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

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

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

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

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

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

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

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

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

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

### Aerospace is vital to heg- laundry list

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

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

## Democracy Impact

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

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

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

### Democracy solves extinction and all your impacts

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

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

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

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

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

## Disaster Relief & Humanitarian Aid

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

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

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

( ) Terminal Impact

## Prolif Impact

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

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

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

Utgoff 2

X\_\_\_\_\_\_\_\_\_

## Drug Trafficking Impact

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

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

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

### Drug Trafficking Provides Funding for Terrorists

**DEA, 2** [Drug Enforcement Administration, September 2002, “Drugs and Terrorism: A New Perspective”, US DRUG ENFORCEMENT ADMINISTRATION, <http://www.dea.gov/pubs/intel/02039/02039.html>, DA 7/30/11]//RS

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

## Deterrence Impact

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

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

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

### Only nuclear deterrence is sufficient to deter asymmetrical EMP attacks – they cause extinction

Schneider, 8 [Mark Schneider, National Institute for Public Policy, “The Future of the US Deterrent,” Comparative Strategy, Vol 27 No 4, July 2008]

Why can’t the United States deter WMD (nuclear, chemical, biological) attack with conventional weapons? The short answer is that conventional weapons can’t deter a WMD attack because of their minuscule destructiveness compared with WMD, which are thousands to millions of times as lethal as conventional weapons. Existing WMD can kill millions to hundreds of millions of people in an hour, and there are national leaders who would use them against us if all they had to fear was a conventional response. The threat of nuclear electromagnetic pulse (EMP) attack, as assessed by a Congressional Commission in 2004, is so severe that one or at most a handful of EMP attacks could demolish industrial civilization in the United States.3 The view that conventional weapons can replace nuclear weapons in deterrence or warfighting against a state using WMD is not technically supportable. Precision-guided conventional weapons are fine substitutes for non-precision weapons, but they do not remotely possess the lethality of WMD warheads. Moreover, their effectiveness in some cases can be seriously degraded by counter-measures and they clearly are not effective against most hard and deeply buried facilities that are associated with WMD threats and national leadership protection. If deterrence of WMD attack fails, conventional weapons are unlikely to terminate adversaryWMDattacks upon us and our allies or to deter escalation.

### Air power is key to deterrence and counterinsurgencies—it prevents a U.S.-China war

Dunlap 6 [Maj. Gen. Charles J. Dunlap Jr., deputy judge advocate general of the Air Force and distinguished graduate of the National War College, September 2006, “America’s asymmetric advantage”, Armed Forces Journal, <http://www.armedforcesjournal.com/2006/09/2009013>, DA 7/30/11]//RS

So where does that leave us? If we are smart, we will have a well-equipped high-technology air power capability. Air power is America’s asymmetric advantage and is really the only military capability that can be readily applied across the spectrum of conflict, including, as is especially important these days, potential conflict. Consider the record. It was primarily air power, not land power, that kept the Soviets at bay while the U.S. won the Cold War. And it was not just the bomber force and the missileers; it was the airlifters, as well. There are few strategic victories in the annals of military history more complete and at so low a human cost as that won by American pilots during the Berlin airlift. Armageddon was avoided. And the flexibility and velocity of air power also provides good-news stories in friendly and low-threat areas. For example, huge U.S. transports dropping relief supplies or landing on dirt strips in some area of humanitarian crisis get help to people on a timeline that can make a real difference. Such operations also illustrate, under the glare of the global media, the true American character the world needs to see more often if our strategic goals are to be achieved. Air power also doesn’t have the multi-aspect vulnerabilities that boots on the ground do. It can apply combat power from afar and do so in a way that puts few of our forces at risk. True, occasionally there will be a Francis Gary Powers, and certainly the Vietnam-era POWs — mostly airmen — became pawns for enemy exploitation. Yet, if America maintains its aeronautical superiority, the enemy will not be able to kill 2,200 U.S. aviators and wound another 15,000, as the ragtag Iraqi terrorists have managed to do to our land forces. And, of course, bombs will go awry. Allegations will be made (as they are currently against the Israelis) of targeting civilians and so forth. But the nature of the air weapon is such that an Abu Ghraib or Hadithah simply cannot occur. The relative sterility of air power — which the boots-on-the-ground types oddly find distressing as somehow unmartial — nevertheless provides greater opportunity for the discreet application of force largely under the control of well-educated, commissioned officer combatants. Not a total insurance policy against atrocity, but a far more risk-controlled situation. Most important, however, is the purely military effect. The precision revolution has made it possible for air power to put a bomb within feet of any point on earth. Of course, having the right intelligence to select that point remains a challenge — but no more, and likely much less so, than for the land forces. The technology of surveillance is improving at a faster rate than is the ability to conceal. Modern conveniences, for example, from cell phones to credit cards, all leave signatures that can lead to the demise of the increasing numbers of adversaries unable to resist the siren song of techno-connection. Regardless, eventually any insurgency must reveal itself if it is to assume power, and this inevitably provides the opportunity for air power to pick off individuals or entire capabilities that threaten U.S. interests. The real advantage — for the moment anyway — is that air power can do it with impunity and at little risk to Americans. The advances in American air power technology in recent years make U.S. dominance in the air intimidating like no other aspect of combat power for any nation in history. The result? Saddam Hussein’s pilots buried their airplanes rather than fly them against American warplanes. Indeed, the collapse of the Iraqi armed forces was not, as the BOTGZ would have you believe, mainly because of the brilliance of our ground commanders or, in fact, our ground forces at all. The subsequent insurgency makes it clear that Iraqis are quite willing to take on our ground troops. What really mattered was the sheer hopelessness that air power inflicted on Iraq’s military formations. A quotation in Time magazine by a defeated Republican Guard colonel aptly captures the dispiriting effect of high-tech air attack: “[Iraqi leaders] forgot that we are missing air power. That was a big mistake. U.S. military technology is beyond belief.” It is no surprise that the vaunted Republican Guard, the proud fighting organization that tenaciously fought Iran for years, practically jumped out of their uniforms and scattered at the sound of approaching U.S. aircraft. This same ability to inflict hopelessness was even more starkly demonstrated in Afghanistan. For a millennium, the Afghans have been considered among the toughest fighters in the world. Afghan resistance has turned the countryside into a gigantic military cemetery for legions of foreign invaders. For example, despite deploying thousands of troops, well-equipped Soviet forces found themselves defeated after waging a savage war with practically every weapon at their disposal. So what explains the rapid collapse of the Taliban and al-Qaida in 2001? Modern air power. More specifically, the marriage of precision weapons with precise targeting by tiny numbers of Special Forces troops on the ground. The results were stunning. Putatively invulnerable positions the Taliban had occupied for years literally disappeared in a rain of satellite-directed bombs from B-1s and B-52s flying so high they could be neither seen nor heard. This new, high-tech air power capability completely unhinged the resistance without significant commitment of American boots on the ground. Indeed, the very absence of American troops became a source of discouragement. As one Afghan told the New York Times, “We pray to Allah that we have American soldiers to kill,” adding disconsolately, “These bombs from the sky we cannot fight.” Another equally frustrated Taliban fighter was reported in the London Sunday Telegraph recently as fuming that “American forces refuse to fight us face to face,” while gloomily noting that “[U.S.] air power causes us to take heavy casualties.” In other words, the Taliban and al-Qaida were just as tough as the mujahideen who fought the Russians, and more than willing to confront U.S. ground forces, but were broken by the hopelessness that American-style air power inflicted upon them. Today it is more than just bombing with impunity that imposes demoralization; it is reconnoitering with impunity. This is more than just the pervasiveness of Air Force-generated satellites. It also includes hundreds of unmanned aerial vehicles that are probing the landscape in Iraq and Afghanistan. They provide the kind of reliable intelligence that permits the careful application of force so advantageous in insurgency and counterterrorism situations. The insurgents are incapable of determining where or when the U.S. employs surveillance assets and, therefore, are forced to assume they are watched everywhere and always. The mere existence of the ever-present eyes in the sky no doubt inflicts its own kind of stress and friction on enemy forces. In short, what real asymmetrical advantage the U.S. enjoys in countering insurgencies in Iraq and Afghanistan relates to a dimension of air power. Strike, reconnaissance, strategic or tactical lift have all performed phenomenally well. It is no exaggeration to observe that almost every improvement in the military situation in Iraq and Afghanistan is attributable to air power in some form; virtually every setback, and especially the strategically catastrophic allegations of war crimes, is traceable to the land forces. While it will be seldom feasible for America to effectively employ any sort of boots-on-the-ground strategy in current or future counterinsurgency situations, the need may arise to destroy an adversary’s capability to inflict harm on U.S. interests. Although there is no perfect solution to such challenges, especially in low-intensity conflicts, the air weapon is the best option. Ricks’ report in “Fiasco,” for example, that Iraq’s weapons of mass destruction program never recovered from 1998’s Operation Desert Fox and its four days of air attacks is interesting. It would appear that Iraq’s scientific minds readily conceded the pointlessness of attempting to build the necessary infrastructure in an environment totally exposed to U.S. air attack. This illustrates another salient feature of air power: its ability to temper the malevolent tendencies of societies accustomed to the rewards of modernity. Given air power’s ability to strike war-supporting infrastructure, the powerful impulse of economic self-interest complicates the ability of despots to pursue malicious agendas. American air power can rapidly educate cultured and sophisticated societies about the costs of war and the futility of pursuing it. This is much the reason why air power alone delivered victory in Operation Allied Force in Kosovo in 1999, without the need to put a single U.S. soldier at risk on the ground. At the same time, America’s pre-eminence in air power is also the best hope we have to dissuade China — or any other future peer competitor — from aggression. There is zero possibility that the U.S. can build land forces of the size that would be of real concern to a China. No number of troops or up-armored Humvees, new radios or advanced sniper rifles worries the Chinese. What dominating air power precludes is the ability to concentrate and project forces, necessary elements to applying combat power in hostile areas. As but one illustration, think China and Taiwan. Saddam might have underestimated air power, but don’t count on the Chinese to make the same mistake. China is a powerful, vast country with an exploding, many-faceted economy with strong scientific capabilities. It will take focused and determined efforts for the U.S. to maintain the air dominance that it currently enjoys over China and that, for the moment, deters them. Miscalculating here will be disastrous becasue, unlike with any counterinsurgency situation (Iraq included), **the very existence of the U.S. is at risk**.

### Air Power solves Korean conflict and Asian stability

Bechtol, 5 [Dr. Bruce E. Bechtol Jr. ‘5, Air & Space Power Journal, “The Future of U.S. Airpower on the Korean Peninsula,” Fall, <http://www.airpower.maxwell.af.mil/airchronicles/apj/apj05/fal05/bechtol.html>, DA 7/30/11]//RS

Transformation has come to the Korean Peninsula. The Global Posture Review has prompted a major reduction in the number of ground forces in Korea, and plans call for a withdrawal of 12,500 American troops from Korea (mostly ground forces) by the end of 2008. In addition, Headquarters Command for United States Forces Korea/Combined Forces Command is scheduled to move most of its infrastructure and personnel south, to Camp Humphries (near the city of Pyongtaek) during the same time period.25 The primary American ground forces in Korea, the 2d Infantry Division, should transform into a next-generation combat unit during the summer of 2005, becoming a “unit of employment X” two years ahead of schedule.26 Furthermore, numerous command and funding issues in the ROK-US alliance will remain in flux during completion of the ongoing moves, but a discussion of those matters lies beyond the scope of this article. One must then consider the question of how all of this affects the role of airpower on the Korean Peninsula. The answer is obvious. The ROK-US alliance will now rely more than ever on the unique capabilities of US airpower to deter the North Korean threat. In fact, with all of the effort under way to reorganize US Army forces on the peninsula and move ground-combat units, headquarters facilities, and personnel south, the disposition of US Air Force units has remained relatively unchanged. Gen Leon LaPorte, commander of US Forces Korea, recently stated that the mission of our forces in Korea remains clear (despite taking on a regional role): to defend South Korea against an attack from the North. He also discussed US plans to improve combat capabilities by spending $11 billion over the next three years and to establish five or six Stryker brigades focused on the Pacific region that could deploy to Korea quickly.27 But US forces—especially airpower—remain the best way of enhancing security on the Korean Peninsula. Indeed, in 2003 former Georgetown University professor (and current senior member of the National Security Council) Victor Cha observed that the most reasonable arrangement for the alliance would entail an increased emphasis on US naval and airpower presence with a reduction in ground forces. We are now seeing this happen.28 The threat from North Korea has evolved but remains no less ominous either to US interests or to those of Washington’s important allies South Korea and Japan. Because the threat and geopolitical situation in Asia have changed and, perhaps just as important, because the US military is now transforming, traditional paradigms regarding how we face threats throughout the world no longer apply in many cases—such as Korea. Although a large, forward-deployed ground presence on the Korean Peninsula may no -longer be necessary, providing military support to the ROK-US alliance remains as important as ever. In fact, the deterrence provided by a strong airpower presence continues to have an effect on our enemies, as evidenced by a manual published by the North Korean People’s Army in 2004, which warns that the United States will target North Korea’s military leadership during a time of war.29 The types of US forces that support freedom in South Korea have changed, but Washington’s commitment to the security of that country has not. For the foreseeable future, airpower will continue to play a major (and now a more prominent) role on the Korean Peninsula.

## NASA key to green aviation

### Public efforts key to green aviation.

Watkins et al 06 (Todd, PhD-Harvard and director-Lehigh University’s Institute for Entrepreneurship, Creativity and Innovation, with ALAN SCHRIESHEIM and STEPHEN MERRILL, Glide Path to Irrelevance: Federal Funding for Aeronautics, http://www.issues.org/23.1/watkins.html)

Curtailing environmental degradation. Efforts during the past half century, primarily supported by the federal government, have paid off in significant reductions of both the noise and emissions emanating from turbine engines. But the growth of air traffic over the period has more than offset technological progress. In fact, objections to aircraft noise and emissions have been the primary barriers to building new airports or adding new runways at existing airports. These two steps are key to relieving pressure on the nation’s overburdened air transportation system, simultaneously increasing system capacity and travel speeds. Technical needs here include: Low-emission combustors to reduce emissions of nitrogen oxide and particulate matter Alternative energy sources Structures and materials to reduce drag and improve aerodynamics Understanding aviation’s effect on climate and the need to balance nitrogen oxide and carbon dioxide emissions Improved dispersion models, which look at how pollutants disperse in, react with, and interact with the atmosphere Standardized methods for measuring particulate emissions Improved engine and airframe noise-reduction technologies Reducing sonic boom to enable a new generation of commercial supersonic transports

## ISS Link- Idea for future

### Funding is zero sum – new policies compromise the ISS

Hecht, 2 [Jeff Hecht, Writer for New Scientist, “NASA’s Budget Trouble Threatens Safety,” <http://www.newscientist.com/article/dn2022-nasas-budget-trouble-threatens-safety.html>, DA 7/24/11]//RS

Tight NASA budgets threaten the safety of the space shuttle and the International Space Station, an independent safety panel has warned. Last year in its annual report, the Aerospace Safety Advisory Panel warned NASA it needed better long-term planning to assure safety of the ageing shuttle fleet and the ISS. The new report says "the Panel's safety concerns have never been greater". It blames tight budgets and a concentration on short-term "program survival" for preventing the long-term planning needed to assure continued safety. "The efforts to make the budget a zero-sum game are going to erode safety if they continue," panel chairman Richard Blomberg told New Scientist. NASA has done a good job of assuring each mission is safe, but lacks the money to invest in vital long-term projects. Complex systems like the shuttle change as they age, he says, "and you may find yourself in some uncharted territory where safety can be compromised". The panel has been advising NASA since the Apollo era. Congress created it after a 1967 fire killed three astronauts on the ground. NASA designed the shuttle to operate for 10 years or 100 missions, with the fleet flying 60 times each year. Although the flight schedule has been sharply reduced, the shuttles now are going to be used for at least 30 years. That lifetime could be possible with continual updates and improvements, Blomberg says, but NASA lacks the money to worry about tomorrow when it has to ensure the safety of today's launch. Apollo-era infrastructure and a shrinking and ageing support staff pose additional problems. The massive Vehicle Assembly Building at the Kennedy Space Flight Center in Florida was built in the 1960s to stack Saturn moon rockets. "A lot of test equipment in the program still runs on vacuum tubes," says Blomberg. Engineers and technicians have been able to keep that vital custom-built equipment running for decades, but the experts are reaching retirement age and key components such as tubes are getting hard to find. Although a formal response to the report is months away, Blomberg says NASA administrator Sean O'Keefe seemed receptive. O'Keefe wants to look at alternatives, comparing the costs and benefits of overhauling old facilities with building new ones better-matched to current needs. "NASA has always given a fair and thoughtful response to our findings," says Blomberg, though he acknowledges that he does not have to find the money to implement them.

# Aff Answers

## N/U- Cuts now

### NASA Budget is low now and likely to be cut more

Rhian, 1/17 [Jason Rhian, Universe Today Staff Writer, “NASA Says it Cannot Produce Heavy-Lift Rocket on Time, Budget,”

<http://www.universetoday.com/82535/nasa-says-it-cannot-produce-heavy-lift-rocket-on-time-budget/>, DA 7/25/11]//RS

NASA has sent Congress a report stating that it cannot meet the requirements that it produce a heavy-lift rocket by the current 2016 deadline – or under the current allocated budget. In the NASA Authorization Act of 2010, NASA was directed to develop a heavy-lift rocket in preparation to flights to an asteroid and possibly Mars. NASA said it cannot produce this new rocket despite the fact that the agency would be using so-called “legacy” hardware – components that have been employed in the shuttle program for the past 30 years. NASA would also utilize modern versions of engines used on the massive Saturn V rocket. Now, approximately three months after the act was signed into law, NASA is telling Congress that they can’t build the vehicles that will succeed the shuttle. At least, NASA said, not in the time allotted or for the amount allocated to them. The agency expressed these inadequacies in a 22-page report that was submitted to Congress. In the report, NASA said it “recognizes it has a responsibility to be clear with the Congress and the American taxpayers about our true estimated costs and schedules for developing the SLS and MPCV, and we intend to do so.” “Currently, our SLS (Space Launch System) studies have shown that while cost is not a major discriminator among the design options studied, none of the design options studied thus far appeared to be affordable in our present fiscal condition.” Senators Bill Nelson (D-FL) and Kay Bailey Hutchinson (R-Texas) who helped to draft and pass the NASA Authorization Act said that none of the rationale posted within the report provided justification for NASA not to meet its requirements. Congress has been hoping to shore up any potential failings of the emerging commercial space market by having NASA design, in parallel, a heavy-lift rocket. That way, if these firms don’t produce, the nation has a ‘backup’ in place. NASA has essentially admitted that it cannot accomplish the task set in front of it. Congress might decide to take funds from other areas of the space agency’s budget to fill in the projected shortfall. There have been some suggestions that these funds may come from those intended for Kennedy Space Center (KSC). KSC has already been sent reeling from massive layoffs which are set to continue until the end of the shuttle program. There is no established program set to follow the space shuttle program. Many have tried to compare the gap between shuttle and whatever is to follow to the gap between Apollo and shuttle. But this is a false analogy. At the end of Apollo the next program was established (the space shuttle was approved during the Apollo 16 mission). As the twilight of the shuttle era nears – there no longer is any established program. Under the Vision for Space Exploration, the succeeding program was called Constellation and consisted of a Apollo-like capsule, man-rated rocket the Ares-I (based off a single shuttle solid rocket booster) and a unmanned heavy-lift booster – the Ares-V. While Congress may have signed the directive to produce the new heavy-lift booster into law – they haven’t done as much to pay for it. NASA was supposed to receive $11 billion over the course of the next three years to build both the rocket as well as the Orion spacecraft. Congress is now working to find ways to cut federal spending and NASA could find itself receiving far less than promised.

### Republicans want cuts

Conathan 2/18 [Michael – CAPAF (Center for American Progress Action Fund)’s new director of Oceans policy.

The House of Representatives is debating the Full Year Continuing Resolution Act (H.R. 1) to fund the federal government for the remainder of fiscal year 2011. The Republican leadership has proposed sweeping cuts to key programs across the climate change, clean energy, and environmental spectrum. They have also decided that accurate weather forecasting and hurricane tracking are luxuries America can no longer afford.

## N/U- NASA doing other stuff already

### NASA is taking on new projects now. Montalbano, 11 (Elizabeth, “NASA Plans Future Missions As Shuttle Era Ends”, Senior writer for IDG News Service, July 21st, 2011, Access Date\_7/22/11).

Now that NASA's space shuttle program has ended with the safe return of Atlantis to earth, the agency is looking ahead to future space projects, including a study of the atmosphere of Mars and a project to map the moon's gravity field.

Atlantis landed Thursday at NASA's Kennedy Space Center in Florida, ending 30 years of space exploration through shuttle craft, the first of which—Challenger--was launched in 1983. While the event certainly marks the end of an era, it's hardly the swan song for NASA's exploration into space, as the agency has multiple missions in the works.

### NASA adopting new exploration activities now. Atkinson, 09 (Nancy, “NASA Selects New Projects to Study Mars and Mercury”, a journalist, and a NASA/JPL Solar System Ambassador. As a journalist, she writes mainly about space exploration and science, May 4th, 2009, Access Date\_7/22/11).

Making good on its promise to work together with other space agencies, NASA has selected two science instruments that will fly on board European Space Agency (ESA) spacecraft, one heading to Mars on the ExoMars rover, the other to Mercury with the BepiColombo orbiter. “The selections will further advance our knowledge of these exciting terrestrial planets,” said Jim Green, director of NASA’s Planetary Division at NASA Headquarters in Washington. “The international collaboration will create a new chapter in planetary science and provide a strong partnership with the international science community to complement future robotic and human exploration activities.”

### NASA plans new moon exploration. McKinney, 08 (Luke, “NASA's New Mission: Project Moon Explosion”, February 29th, 2008, Access Date\_7/22/11).

You'll be surprised to know that this mission needs careful navigation. "Surely it's not possible to miss the moon!" you exclaim, but it turns out this isn't just a PR stunt by the space agency - there's vital science at work as well. They're targeting polar craters which have shown tantalizing evidence of hydrogen, where the impact will throw up over a thousand tons of lunar material thanks to the loose nature of the impact site, low gravity and the absence of an atmosphere. A second, less kamikaze satellite will scan this debris for evidence of water, whose presence would revolutionise mankind's plans for our nearest neighbour. But never mind the moonbases and the potential for space - this new method of investigation could bring a better world for everyone right here on Earth. Police being called to "investigate" the driver who blares drum and bass at 2 am will be much more effective, and paparazzi constantly investigating Paris Hilton's love life would soon dissuade her from all fame-seeking. Unfortunately for this, as for many other matters, scientists aren't actually in charge.

## N/U- Cost overruns now

### NASA’s projects- over budget. Watson, 08 (Traci, “Major NASA projects over budget”, USA Today, March 26th, 2008, Access Date\_7/22/11).

WASHINGTON — Two-thirds of NASA's major new programs are significantly over budget or behind schedule, according to the agency's latest report to Congress. NASA's nearly stagnant budget requires the agency to cut projects to make up for unexpected expenses, and cost overruns nearly shut down one of the rovers on Mars — until it got a reprieve Tuesday. They also threaten completion of a climate-change satellite called Glory. Under a 2005 law, the space agency must tell Congress when a major project under development will exceed its budget by more than 15% or fall more than six months behind schedule. Four of the 12 new major projects are over budget, and eight are behind schedule to the point where lawmakers needed to be notified.

## NASA doesn’t do satellites, space tourism, or space manufacturing

### NASA doesn’t have the authority to do SBSP, space tourism, or space manufacturing

Dinerman 08 [Taylor - a well-known and respected space writer regarding military and civilian space activities. “NASA and space solar power”. May 19, 2008 ayc http://www.thespacereview.com/article/1130/1]

NASA is not the US Department of Spatial Affairs: it does not have the statutory authority to control, regulate, or promote commercial space activities such as telecommunications satellites, space tourism, space manufacturing, or space solar power. Such powers are spread throughout the government in places like the FAA’s Office of Commercial Space Transportation, the Department of Commerce, and elsewhere. Even if NASA were somehow to get the funds and the motivation to do space solar power, these other institutions would resist what they would recognize as an encroachment on their turf.

## NASA’s Climate Monitoring Fails

### NASA’s earth climate monitoring fails - the satellites never made it into orbit

Simberg 3/11 [Rand - a recovering aerospace engineer and a consultant in space commercialization, space tourism and Internet security. “Eerie Coincidences in Failure of NASA Climate Monitoring Satellites”. March 8, 2011 ayc]

Orbital Sciences Corporation (OSC) and NASA had a bad day late last week. A $424 million satellite named Glory, designed to monitor aerosols and solar irradiance that contribute to changes in climate, failed to be properly delivered to space, when the fairing of the company’s Taurus launch system failed to separate from the payload. The extra mass of the dangling nose cone meant that the propulsion system of the upper stage didn’t have enough oomph (to use the technical term) to get it into orbit, delivering it and its valuable payload instead to the bottom of the Pacific Ocean near Antarctica. While launch systems have become more reliable over the years, launch failures still happen, and failure to separate critical parts at staging is one of the most common cause of them. Because the Taurus is a four-stage system, it has more opportunities to encounter this failure mode than most vehicles. What is very strange, however, is that this is the second such failure in a row for OSC. Just a little over two years ago, on February 24th, 2009, a Taurus assigned to deliver the Orbiting Carbon Observatory (OCO) met exactly the same fate, and the two lost satellites are probably sitting on the ocean floor not far from each other. After that failure, OSC conducted an investigation to determine its cause. Apparently, that investigation failed as well, because if they had discovered and fixed the problem, it’s unlikely it would have happened again on Friday. It’s worth pointing out that the Taurus doesn’t fly very much. There have only been four flight attempts in the past decade: three of them were failures, including the last two consecutive disasters already described. When you only do something every two and a half years on average, it’s easy to get things wrong from lack of practice. There’s an optimal “tempo” for launch operations. Try to do things too fast, or too slowly, and the odds of failure can go up dramatically (one of the many reasons why proposals to continue to fly the Shuttle, but at only a couple flights a year, are a bad idea). But there’s something else funny going on here, and not in the holding-your-sides-with-laughter sense, that could create fodder for the conspiracy minded. Both OCO and Glory were specifically designed to help resolve the controversial issue of the degree to which earth’s climate is changing and if so, the degree to which human actions are the cause. NASA has been one of the many agencies criticized in the wake of the Climaquiddick scandal of late 2009 for fudging data, such as throwing out results from Siberian temperature monitoring stations, and generally massaging things in a way that somehow always seemed to confirm the politically correct AGW theory. These two satellites were designed to take human judgement out of the monitoring and modeling loop, to provide direct and unbiased global sensor data on things such as carbon levels, clouds, irradiation, and other factors that are crucial to understanding the planet’s climate and its variability. Billions of dollars in continuing research grants and vast amounts of political power lie in ensuring that concern over global warming be kept at a boil. So if there were a person or persons concerned that the satellites might come up with the “wrong” answer, they might be highly motivated to make sure that they never got an opportunity to perform their respective missions. Of course, if so, it would behoove them to do so in such a way as to make it look like an accident. And interestingly, this is exactly the kind of failure that could easily be dressed up for that kind of show. All it takes to prevent a separation is to go up on the gantry after launch processing has been completed and add something to bind the fairing to the stage. Depending on what kind of separation mechanisms are used (mechanical, such as springs, versus explosive), duct tape might even do the job. Of course, it would also take extremely lax security at the launch site, which is inside the boundaries of Vandenberg Air Force Base on the central coast of California. The notion that the company itself would do this for pay is ludicrous, of course — their launch insurance rates are going to skyrocket after this, and it might even be the end of the rarely launched Taurus program. It will also have an impact on their prospects for continuing their existing contracts to deliver cargo, and potential contracts to later deliver crew to the International Space Station. But that doesn’t necessarily mean that they don’t have an employee on someone else’s payroll. When OSC did their failure investigation, one would assume that they considered sabotage, but if so, they must have ruled it out as a cause, or they wouldn’t have made whatever fixes they thought would solve the problem this time, but didn’t. This time, they may have to take the possibility more seriously, though it is still very unlikely. It would be a tremendous, James Bondian challenge to carry out such an act in the security environment of Vandenberg, but with the potential amount of money involved, it shouldn’t be viewed as completely impossible. As improbable a scenario as it is, the coincidence does seem quite eerie. And at stake is not just three-quarters of a billion dollars worth of satellites, but the continuing debate over our role in earth’s climate and the appropriate political response to it.

## Climate Monitoring is doomed in the future

### Climate monitoring is doomed – the failures cause a loss of funding and interest

Borenstein 3/4 [Seth – writer for the Associated Press, MSNBC. “Lost satellite deals heavy blows to climate research”. 3/4/2011 ayc]

For the second time in two years, a rocket glitch sent a NASA global warming satellite to the bottom of the sea Friday, a $424 million debacle that couldn't have come at a worse time for the space agency and its efforts to understand climate change. Years of belt-tightening have left NASA's Earth-watching system in sorry shape, according to many scientists. And any money for new environmental satellites will have to survive budget-cutting, global warming politics — and now, doubts on Capitol Hill about the space agency's competence. The Taurus XL rocket carrying NASA's Glory satellite lifted off from Vandenberg Air Force Base in California and plummeted to the southern Pacific several minutes later. The same thing happened to another climate-monitoring probe in 2009 with the same type of rocket, and engineers thought they had fixed the problem. "It's more than embarrassing," said Syracuse University public policy professor Henry Lambright. "Something was missed in the first investigation and the work that went on afterward." Lambright warned that the back-to-back fiascos could have political repercussions, giving Republicans and climate-change skeptics more ammunition to question whether "this is a good way to spend taxpayers' money for rockets to fail and for a purpose they find suspect." Used to failure NASA's environmental division is getting used to failure, cuts and criticism. In 2007, a National Academy of Sciences panel said that research and purchasing for NASA Earth sciences had decreased 30 percent in six years and that the climate-monitoring system was at "risk of collapse." Just last month, the Obama administration canceled two major satellite proposals to save money.