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# 1AC

## Contention 1: Inherency

### US space program scheduled to end in July

Chow, space.com staff writer, 5/31/11 (Denise, “One Final Trip: Shuttle Atlantis Moves to Launch Pad for Last-Ever Mission,” http://www.space.com/11833-nasa-shuttle-atlantis-launch-pad-final-move-sts135.html.)

CAPE CANAVERAL, Fla. – Like a winged sentinel gleaming in white, the orbiter Atlantis made one last trek to the launch pad tonight (May 31) to prepare for its July 8 blastoff — a final voyage for NASA after 30 years of space shuttle flights. Atlantis began the slow crawl to Launch Pad 39A here at the Kennedy Space Center at 8:42 p.m. EDT (0042 June 1 GMT), emerging from the massive 52-story Vehicle Assembly Building bathed in bright xenon spotlights. The 3.4-mile (5.2-kilometer) journey to the seaside pad atop NASA's Apollo-era crawler transporter typically takes about six hours. Tonight's move, which was delayed slightly due to a hydraulic leak on the massive carrier, is the last trip any shuttle will take to the launch pad, since NASA will retire its space shuttle after Atlantis' flight. Thousands of spectators turned out to watch Atlantis move to the pad for the very last time, and the four astronauts who will fly the shuttle's mission, which NASA calls STS-135, were on hand to mark the historic event. "We couldn't be more honored to be here and share it with them," pilot Doug Hurley told reporters during the rollout event. "Obviously, the priority for us is to safely accomplish the STS-135 mission, but I think, almost as strong, is to just be able to share this experience with the folks who have worked on this vehicle for 30-plus years. We wouldn't be anywhere else but here tonight, so we're very honored to be here." Hurley was joined by his crewmates, shuttle commander Chris Ferguson and mission specialists Sandy Magnus and Rex Walheim. Atlantis, the second oldest of NASA's space shuttles still flying, is scheduled to launch on the shuttle program's final mission no earlier than July 8. An official launch date will be announced by mission managers following a Flight Readiness Review on June 28. The historic flight will be the 135th and final mission of NASA's space shuttle program, which began flying in 1981.

### NASA has no viable alternative – Russia is inadequate

AFP ‘ (Agence France-Presse, 1/13/11 , “End of U.S. shuttle program poses safety risks, panel says”, http://www.mnn.com/earth-matters/space/stories/end-of-us-shuttle-program-poses-safety-risks-panel-says)

A climate of uncertainty in the US space program combined with the approaching retirement of the shuttle missions presents safety risks, a government advisory panel said Thursday. "Lack of clarity and constancy of purpose among NASA, Congress, and the White House is a key safety concern," the Aerospace Safety Advisory Panel said in its annual report. "From the aspect of safety, the lack of a defined mission can negatively affect workforce morale and the ability to attract and maintain the necessary skill sets needed for this high-technology venture," it said. The report came on the heels of news that NASA was bickering with US senators over plans to build a new spacecraft and rocket to replace the shuttle mission by 2016. The US space agency says the current vision for a new rocket and spacecraft would be too complicated to finish in the time constraints set forth by Congress, and too expensive given the budget it is allocated. Meanwhile, the safety panel noted that once the shuttle fleet retires later this year, the United States, Europe, Japan will be dependent on Russian Soyuz vehicles for transport to the International Space Station. While it did not criticize the safety record of the Russian space program, the panel said that because only one form of transport is available, risks will inherently increase. "Any time one depends on a single-source solution, one runs the added risk of interruption in service due to some unforeseen contingency affecting that source," it said. "We have no evidence that Progress and Soyuz will be anything but as reliable as they have been; however, risk rises as the simple offshoot of dependence on a single-source provider." The panel said it would continue to study "the risks inherent in this single-source service scenario" over the coming year.

## Plan Text

### Resolved: The United States Federal Government should not retire its space shuttle program until the National Aeronautics and Space Administration develops a viable replacement.

## Adv 1 – International Space Station 1/8

### The ISS will atrophy absent a renewed US shuttle program – other countries cannot adequately maintain the Station

Augustine, Norman (Chairman of the U.S. Human Spaceflight Plans Committee). 2009. ("SEEKING A HUMAN SPACEFLIGHT PROGRAM WORTHY OF A GREAT NATION." 2 Review of U.S. Human Spaceflight Plans Committee (2009): 54. Web. <legislative.nasa.gov/396093main\_HSF\_Cmte\_Final Report.pdf>.)jk

The extension of the ISS operations brings its own technical issues. Currently, if a significant part fails on the ISS, this part is returned to Earth and refurbished. Once the Shuttle retires, that will no longer be possible; new parts will have to be procured and lifted to the ISS. To prepare for Shuttle retirement, NASA has begun carrying spare parts up to the ISS—this provisioning is intended to supply the ISS through 2015. If the ISS is extended, additional spares must be procured and the suppliers retained. Further, there are a few parts too large for any of the planned cargo vehicles to lift. In addition, some components of the ISS (e.g., the U.S. laboratory) will reach the end of their certified life in 2015 or shortly thereafter. It is clear to the Committee that if the ISS is to be extended, planning for that should begin immediately. How well the ISS is exploited depends to a considerable degree on whether its management focuses on utilization.

### Continued maintenance of the ISS is critical to prevent extinction – two scenarios.

### First is colonization

Adv 1 – International Space Station 2/8

### The ISS is critical to space colonization it provides the only means to test life support technologies in space

Chow, staff writer, space.com, 4/7/11 (Denise, “Space Station Crucial for Going to Mars, NASA Chief Says,” http://www.space.com/11335-nasa-mars-exploration-space-station.html.)

NASA is on track to send humans to Mars, the space agency's chief said Wednesday (April 6). Addressing an auditorium full of scientists, industry members, educators and former astronauts, NASA Administrator Charles Bolden said the agency committed to a future manned mission to Mars, and that the International Space Station is a vital test bed for getting there. "The International Space Station is the centerpiece for our human exploration and our spaceflight endeavors in the coming decade," Bolden said. "I like to say it's our anchor for the future of human exploration. The station is our start to the journey outward." Bolden delivered the keynote address at the International Space Station and Mars Conference, a two-day event held here at George Washington University. The conference was presented by Explore Mars, an organization that promotes scientific and technological innovation in support of Mars exploration. The conference aimed to discuss how the International Space Station can be used as a research asset and test facility in preparation for future human exploration of our solar system neighbor. The International Space Station is the largest human-built structure ever constructed in space, and is the product of cooperation between five different space agencies representing 15 countries. Construction of the $100 billion orbiting lab began in 1998. NASA completed its parts of the space station last month, with Russia's Federal Space Agency planning to add at least one more large laboratory module sometime next year. NASA and its partners plan to keep the space station operating through at least 2020. "Over the next 10 years, we'll continue to collaborate with other nations to live and work together in space, and perform cutting edge research and technology demonstrations that are critical to our eventual exploration into deep space with humans," Bolden said. "The ISS is the most realistic analog we have to test life support and other technologies, ensuring they function in space, and most importantly, that they are reliable." In addition to the scientific and technological lessons the space station might offer, the orbiting lab also represents an ongoing successful cooperation between different nations toward broad and unifying goals, Bolden said. And this collaboration will likely act as an important precedent for future missions to Mars, NASA's chief said. "Any mission to Mars is likely to be a global effort," Bolden said. "The ISS is a blend of goals among the participating space agencies, and it is truly beautiful in that regard alone." With the agency's space shuttle program set to come to a close later this year, NASA has set lofty goals to visit an asteroid in 2015 and Mars sometime in the 2030s. Bolden described the years ahead as an incremental journey to the Red Planet, and claimed that the stepping stones of the program could serve as inspiration for a whole new generation. As he spoke about his vision for the future, the former astronaut's voice welled with emotion. "I know my granddaughters will be witnessing humans arriving at Mars," Bolden said. "Like the President, I believe such a journey is possible in my lifetime. But what I know today is that we have an amazing engineering resource in space right now – the International Space Station. And we're moving out on the innovation and technological breakthroughs that are required to get us to our neighboring planet."

Adv 1 – International Space Station 3/8

### These technologies guarantee successful colonization – technical and political obstacles can be overcome

Kevin Nolan, Lecturer in Physics, Tallaght Institute of Technology, ‘8, MARS: A Cosmic Stepping Stone, DOI: 10.1007/978-0-387-49981-9\_20, p. 335-6

Despite the enormous technical challenges to be overcome just to get people to and from Mars, even more challenging will be guaranteeing the survival, physical health, and mental wellbeing of the crew. Indeed the challenges here are so great that it is not clear that they can be overcome, given current design reference missions, technological capability, know-how, and counter-measures. If a decision is made not to send people to Mars, it is less likely to be on the grounds of technical inability or political sensitivity than on a fundamental inadequacy in our understanding of human health and our physiological and psychological requirements for a three-year deep-space mission. The most vulnerable "components" of the entire mission will obviously be the crew, and until launch date the majority of our efforts must be channeled into developing adequate survival and sustaining systems, as well as extensive countermeasures to the many hazards that will be encountered during the expedition. Several critical factors—of which we currently know very little simply because nobody has ever had to endure such a feat—could have such an adverse effect on the long-term wellbeing of the crew that the mission itself could be jeopardized. First is complete confinement for a three-year period and its resulting detrimental effects on the physical condition of the crew, their mental and psychological condition, and even on how illness is brought on and coped with. Second is the significant solar and cosmic radiation hazard to be endured during all stages of the expedition—en route to Mars, on the surface and on the return journey. Third is the effects of microgravity (near-zero gravity) on the human physiology especially concerning muscle and bone mass. And so before any commitment is made to a human mission to Mars, all the above issues need to be thoroughly addressed and understood, with completely effective countermeasures in place to ensure the mission's success and the wellbeing of all individuals on board. When we examine the [335-336] components of the various threats, however, it becomes soberingly apparent just how enormous will be the efforts to overcome them.

Adv 1 – International Space Station 4/8

### And, Only the ISS provides the platform necessary to carry out repairs in orbit critical to colonization

Hauser, Marty. 2009. ((Marty Hauser is the VP of Research and Analysis of the Space Foundation)"The International Space Station: Decicion 2015." Space Foundation (2009): 10.)jk

If the United States intends to undertake long-duration exploration missions, it is essential that NASA collects empirical data on the maintainability and availability of space hardware systems. This can only be accomplished with operating experience, and the ISS offers this capability. NASA has already been able to develop and refine ventilation systems, air filtration systems, water recycling systems, and oxygen producing systems, to name only a few. When hardware components malfunction, the ISS crews have demonstrated creativity, collaboration, and teamwork in order to carry out repairs in orbit. This has led to the development of new repair techniques and has provided valuable lessons on what does and does not work in space.35 The benefits of having a relatively close “island in space” where systems can be tested are evident in the experience with the Remote Power Control Mechanism. This component, similar to a circuit breaker, is used frequently in space systems. When this component malfunctioned, NASA was able to study the problem and create an improved version. Thousands of replacements were shipped to the ISS and installed. Had this problem occurred on a vehicle destined for the Moon or Mars, studying the problem, creating replacements, and carrying out repairs would have been much more difficult, if not impossible.

Adv 1 – International Space Station 5/8

### Only Colonization solves extinction from disease, space objects, and nuclear war

Huang 5

[Michael Huang, “Spaceflight or Extinction”, cites Carl Sagan who was a professor of astronomy and space sciences at Cornell University, cites J. Richard Gott III who is a professor of astrophysical sciences at Princeton University, cites Martin Rees who is a professor of cosmology and astrophysics and Master of Trinity College at the University of Cambridge. http://www.spaext.com/]

[If there are civilizations elsewhere in the universe,] Their eventual choice, as ours, is spaceflight or extinction. Carl Sagan ...the only factor that appears to have improved a family of organisms’ chance of survival was widespread geographic colonization at the time of the event. The Columbia Encyclopedia The goal of the human spaceflight program should be to increase our survival prospects by colonizing space. J. Richard Gott The aim of astronautics is “to extend life to there”, to establish habitats beyond Earth. This should be achieved not only for its intrinsic value, but to ensure the safety of the human species through a critical stage of its development. A civilization restricted to the surface of a single planet has inevitable threats to its long-term existence. Natural threats such as epidemics and impacts from space objects, and man-made threats such as nuclear and biological war, will be joined by new threats from emerging sciences and technologies. If we have self-sufficient human settlements throughout the solar system, and access to life support technology on Earth, humankind would have a secure future. A global catastrophe, although terrible, would not end the human species and the potential of a universe filled with intelligent life. We have a choice between two possible futures: spaceflight or extinction. To do nothing is a choice for the second future. The aim of this web site is to contribute towards the first. The theme of this book is that humanity is more at risk than at any earlier phase in its history. The wider cosmos has a potential future that could even be infinite. But will these vast expanses of time be filled with life, or as empty as the Earth’s first sterile seas? The choice may depend on us, this century.

Adv 1 – International Space Station 6/8

### Second is combustion research

### The ISS provides critical infrastructure to conduct microgravity experiments

NASA ’08 (National Aeronautics and Space Administration, 5/20/08, “Unlocking Mysteries in Microgravity: NASA Glenn Provides the Keys With the Fluids and Combustion Facility”, http://www.nasa.gov/centers/glenn/about/fs07grc.html)

The term "microgravity" will become more commonplace when the International Space Station (ISS) is fully operational. The ISS will be the largest orbiting space structure and the largest international scientific and technological endeavor in history. So far 16 countries, including the United States, are participating in this recordbreaking project. The ISS will be a permanent laboratory in space where studies can be performed without the effects of gravity. The Space Station will provide researchers with all the laboratory space and equipment and electrical power needed for safe, long-term research by human beings in space. The ISS will enable larger and longer experiments than are possible on the typical two-week space shuttle mission. This will give scientists time for more detailed observation in the microgravity environment. The knowledge gained from ISS microgravity experiments will benefit research on Earth in many fields. Our understanding of theories relevant to everything from high-temperature superconductivity to weather prediction will be advanced. New insights into areas such as human health and disease prevention and treatment will be achieved. In addition, scientists will use the microgravity environment to uncover other, more subtle forces and interactions in fluids and materials. By essentially taking gravitational effects out of the equation, researchers will be able to study as primary characteristics what would have been secondary behaviors on Earth. Simple investigations of fluid interfaces and combustion processes can be addressed in small, contained experiments, such as the shuttle Glovebox experiments. However, more complex and challenging investigations require dedicated facilities to contain fluids and products of combustion in a controlled and safe environment.

Adv 1 – International Space Station 7/8

### Microgravity research generates improvements in combustion efficiency – reducing pollution and preventing climate change.

NASA ’11 (National Aeronautics and Space Administration, 4/20/11, “Could Burning Fuel on the Space Station Ultimately Save Fuel on Earth?”, http://www.nasa.gov/mission\_pages/station/research/news/slice.html/)

Flame studies on Earth are hampered by gravity-induced instability -- picture a flickering candle flame -- which complicates analysis. This is due to buoyancy, which is when less dense materials rise within a fluid of greater density -- this time imagine a hot air balloon. Buoyancy is nearly absent in microgravity, making it possible to study a broader array of flame characteristics, such as the range of soot concentration and the flame temperature. Project scientist and co-investigator Dennis Stocker explains the benefits of investigating flames in space, "It is possible to study spherical (i.e., one-dimensional) flames in microgravity, which is not possible in Earth gravity, but dramatically simplifies the otherwise complex analysis. Microgravity flames have large scales and long residence times, allowing for improved studies of the flame structure and soot, respectively…An understanding of lifting and lifted behavior is also valuable, because of the importance of flame stability and the potential benefits for combustion at fuel lean conditions where both optimum performance and low emissions can be achieved." Here on Earth, knowledge from space station flame studies can contribute to reduced pollution. Stocker points out that even small gains in combustion efficiencies can lead to significant improvements, given the high use of fuels to warm homes, cook food, and fuel vehicles from cars to spacecraft. "While we benefit greatly from combustion, it is a significant source of greenhouse gasses and contributes to the global climate change. Furthermore, combustion-caused pollutants, like soot, harm our health and unwanted fire remains an important safety risk."

### Combustion is the biggest contributor to global warming

GB-ANALYSTS REPORTS ‘8 (Integrated Knowledge-Based Analyses of Socio-Economic Issues, 5/22/08, “Greenhouse Gases & Global Warming, and Impact”, http://www.gbanalysts.com/Reading%20Room/Situation%20Analysis/EnvironAnalysis/ghgasgwarmimp.html)

Man has generated this imbalance by several means but the most prominent contributor is the carbon dioxide gas that is produced as byproduct of the activities of man. The primary means by which human beings have generated the carbon dioxide is through the combustion of fuel, mostly the fossil fuels, which are Coal, Crude Oil and Natural Gas. Ordinarily in an ecosystem in balance, these fossil fuels or materials are several feet deep in the earth and so do not readily get combustion. However, with technological advances human beings routinely combust large quantities of these fuels to produce energy support myriads of needs to be met. In all cases of the combustion of the fossil fuel, however, the products are carbon dioxide and water in the ideal case, otherwise some Carbon Monoxide and Methane - the main component of Natural gas - are also produced. All these being part of the greenhouse gas collection creates the same effect.

Adv 1 – International Space Station 8/8

### Global warming causes extinction

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(Oliver, Climate Researcher, The Gaurdian, “On a planet 4C hotter, all we can prepare for is extinction”, 8/11http://www.guardian.co.uk/commentisfree/2008/aug/11/climatechange)

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

## Advantage 2 – Space Primacy 1/9

### Retiring the space shuttle eviscerates US leadership in space

Stone 11 (Christopher Stone, professor of International Law at USC, Fellow of Law and Economics at University of Chicago, Harvard graduate. 3-14-11. “American Leadership in Space” <http://www.thespacereview.com/article/1797/1>)

The world has recognized America as the leaders in space because it demonstrated technological advancement by the Apollo lunar landings, our deep space exploration probes to the outer planets, and deploying national security space missions. We did not become the recognized leaders in astronautics and space technology because we decided to fund billions into research programs with no firm budgetary commitment or attainable goals. We did it because we made a national level decision to do each of them, stuck with it, and achieved exceptional things in manned and unmanned spaceflight. We have allowed ourselves to drift from this traditional strategic definition of leadership in space exploration, rapidly becoming participants in spaceflight rather than the leader of the global space community. One example is shutting down the space shuttle program without a viable domestic spacecraft chosen and funded to commence operations upon retirement of the fleet. We are paying millions to rely on Russia to ferry our astronauts to an International Space Station that US taxpayers paid the lion’s share of the cost of construction. Why would we, as United States citizens and space advocates, settle for this? The current debate on commercial crew and cargo as the stopgap between shuttle and whatever comes next could and hopefully will provide some new and exciting solutions to this particular issue. However, we need to made a decision sooner rather than later.

Advantage 2 – Space Primacy 2/9

### The decision to retire the manned space program is already eroding the perception of strong US hegemony

Dowd, senior fellow with the Fraser Institute, 8/3/09 (Alan W., “Surrendering Outer Space,” Policy Review No. 156, http://www.hoover.org/publications/policy-review/article/5421.)

Surrendering the ability to carry astronauts into space promises to be a blow to America’s international stature. And in this age of global connectivity and global competition, what may seem like a marginal matter could become a serious problem. We already live at a time America is perceived as a nation in decline. Pierre Hassner of the Paris-based National Foundation for Political Science recently concluded, “It will not be the New American Century.” A 2005 piece in the Guardian dismissed America as “the hollow superpower.” It’s no wonder that Obama addressed the “nagging fear” of America’s decline in his inauguration speech, and Bush dismissed “the belief that America is in decline” in his 2006 State of the Union address. What’s relevant here is how America’s self-imposed absence from space could fuel the declinist fire, weaken America’s standing, and enhance the position of America’s enemies. Again, history is instructive: When Sputnik rocketed into orbit and Moscow triumphed, Senator Henry Jackson called it “a national week of shame and danger.” America’s attempt to match Moscow only highlighted the gap between the two superpowers when, weeks after Sputnik, America’s answer, Vanguard, exploded on takeoff. Leebaert writes that Moscow’s initial space superiority was “alarming because it was far more visible than anything else in science and technology.” Combined with America’s futility, the situation negatively impacted the country’s prestige and security, “the two in those days being habitually linked.”11 Even if Washington overstated the damage to U.S. security caused by Sputnik, there was a real sense that America was no longer chasing the future and setting the pace. It is possible that America’s coming retreat from space could have a similar effect. We have zigzagged up and mostly down from post-Sputnik paranoia, to profligacy, to pay-go space exploration, to purchasing seats and storage on Russian rockets. To be sure, we must guard against a return to what Paul Johnson once called “the show-biz era of space travel,” with “its contempt for finance, its assumption that resources were limitless.” But there is a happy medium between yesterday’s space-spending frenzy and today’s under-funded minimalism.

Advantage 2 – Space Primacy 3/9

### Loss of US space primacy undermines warfighting and overall hegemony

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

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

Advantage 2 – Space Primacy 4/9

### Hegemony key to de-escalate conflict – collapse causes multiple hotspots to escalate – causes global nuclear war

Robert Kagan (Senior Associate at the Carnegie Endowment for International Peace and Senior Transatlantic Fellow at the German Marshall Fund) 2007 “End of Dreams, Return of History,” Hoover Institution, No. 144, August/September, http://www.hoover.org/publications/policy-review/article/6136

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

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<Continued> destabilizing. It could tempt Russia to an even more overbearing and potentially forceful approach to unruly nations on its periphery.

Although some realist theorists seem to imagine that the disappearance of the Soviet Union put an end to the possibility of confrontation between Russia and the West, and therefore to the need for a permanent American role in Europe, history suggests that conflicts in Europe involving Russia are

possible even without Soviet communism. If the United States withdrew from Europe — if it adopted what some call a strategy of “offshore balancing” — this could in time increase the likelihood of conflict involving Russia and its near neighbors, which could in turn draw the United States back in under unfavorable circumstances. It is also optimistic to imagine that a retrenchment of the American position in the Middle East and the assumption of a more passive, “offshore” role would lead to greater stability there. The vital interest the United States has in access to oil and the role it plays in keeping access open to other nations in Europe and Asia make it unlikely that American leaders could or would stand back and hope for the best while the powers in the region battle it out. Nor would a more “even-handed” policy toward Israel, which some see as the magic key to unlocking peace, stability, and comity in the Middle East, obviate the need to come to Israel ’s aid if its security became threatened. That commitment, paired with the American commitment to protect strategic oil supplies for most of the world, practically ensures a heavy American military presence in the region, both on the seas and on the ground. The subtraction of American power from any region would not end conflict but would simply change the equation. In the Middle East, competition for influence among powers both inside and outside the region has raged for at least two centuries. The rise of Islamic fundamentalism doesn ’t change this. It only adds a new and more threatening dimension to the competition, which neither a sudden end to the conflict between Israel and the Palestinians nor an immediate American withdrawal from Iraq would change. The alternative to American predominance in the region is not balance and peace. It is further competition. The region and the states within it remain relatively weak. A diminution of American influence would not be followed by a diminution of other external influences. One could expect deeper involvement by both China and Russia, if only to secure their interests. 18 And one could also expect the more powerful states of the region, particularly Iran, to expand and fill the vacuum. It is doubtful that any American administration would voluntarily take actions that could shift the balance of power in the Middle East further toward Russia, China, or Iran. The world hasn ’t changed that much. An American withdrawal from Iraq will not return things to “normal” or to a new kind of stability in the region. It will produce a new instability, one likely to draw the United States back in again.

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### US space primacy drives an indigenous space sector that’s key to overall US economic competitiveness and technological innovation

Griffin, Administrator, National Aeronautics and Space Administration, 6/17/07 (Michael D., “The Space Economy,” http://www.nasa.gov/pdf/189537main\_mg\_space\_economy\_20070917.pdf.)

But if technological innovation drives competitiveness and growth, what drives innovation? There are many factors, but the exploration and exploitation of the space frontier is one of them. The money we spend – half a cent of the Federal budget dollar – and the impact of what we do with it, doesn’t happen “out there.” It happens here, and the result has been the Space Economy. So if America is to remain a leader in the face of burgeoning global competition, we must continue to innovate, and we must continue to innovate in space. There is another factor driving innovation as well, too often overlooked, or if seen, too often dismissed. Success in an economic competition depends upon image as well as substance. Companies the world over have a choice as to where to do deals, and with whom to do them. The nation that appears to be at the top of the technical pyramid has taken a large step toward being there in fact. Developing countries like China recognize the value of space activities as a driver of innovation, a source of national pride, and a membership in the most exclusive of clubs – that of spacefaring societies. And it is no coincidence that we’re seeing thousands of high-tech start-ups in China. NASA is uniquely positioned to drive the Space Economy with both substance and style, because our mission requires us to push the technological envelope every day, and to do it in the most publicly visible manner of any human enterprise. Our human and robotic ventures into the solar system, our attempts to fathom the mysteries of the Universe, require for their accomplishment a voyage of discovery beyond the limits of knowledge, and they are accomplished for all to see on a stage of breathtaking scope and grandeur. At once, we have an endeavor which places the highest possible demands on technical ingenuity, requires a calculated yet stunning audacity for its success, and returns a product with which all the world is fascinated. And even when we fail, we do so, in Teddy Roosevelt’s immortal words, “while daring greatly”. This is why, each year, the National Air and Space Museum is the world’s most visited museum. At NASA we explore the frontier; in fact, we create that frontier. To do it, we have to answer a lot of questions that wouldn’t even have been questions without that commitment to the unknown. The answers to those questions are answers that power our future. Because our mission is flight in all its forms, in space and in the air, we think and work and do our engineering and our science at the extremes – and that’s where the greatest discoveries are made. In celebration of its 25 th birthday, USA Today recently offered a list of the 3“Top 25 Scientific Breakthroughs” which have occurred since its founding. Nine of them come from space, eight of them directly from NASA. We see the transformative effects of the Space Economy all around us through numerous technologies and life-saving capabilities. We see the Space Economy in the lives saved when advanced breast cancer screening catches tumors in time for treatment, or when a heart defibrillator restores the proper rhythm of a patient’s heart. We see it when GPS – the Global Positioning System – developed by the Air Force for military applications – helps guide a traveler to his or her destination. We see it when weather satellites warn us of coming hurricanes, or when satellites provide information critical to understanding our environment and the effects of climate change. We see it when we use an ATM or pay for gas at the pump with an immediate electronic response via satellite. Technologies developed for exploring space are being used to increase crop yields and to search for good fishing regions at sea. Sometimes a personal example carries more weight than the most comprehensive factual data. So consider the case of Sarah Moody and her young nephew, Steve, who was born with a rare disorder. He had no sweat glands to cool down during the summer, and his body would overheat dangerously. After one too many close calls, Sarah thought to herself what many have thought before: if we can put a man on the Moon, why can’t someone figure out a solution to Steve’s problem? So she called NASA, and was put through to what is now our Innovative Partnerships Program. NASA scientists were able to adapt cooling technologies developed for the Apollo astronauts to create a cooling vest for Steve. It worked. Sarah started a foundation that has delivered some 650 such vests to people suffering similar disorders. Her foundation also turned to NASA for help with kids who had to live in dark rooms to avoid suffering tumors when exposed to ultraviolet light. NASA’s contractors helped create suits that blocked it, allowing these kids to go outside. Sarah Moody died a few years ago, but her legacy lives on. Gary Thompson, an athletic 50-year-old man with a family history of heart disease, was given a clean bill of health in a series of tests with several doctors a few years ago, then had a heart attack while running a marathon. He survived, and subsequently heard of a new ultrasound imaging technology derived from algorithms used to process images of Mars at the NASA Jet Propulsion Laboratory. He was diagnosed correctly with this new technology, something all the other tests had failed to do. He was so impressed, he started a company, Medical Technologies International Inc., to make this new technology more widely available. It is now in use across the country. These examples only begin to tell the story. All of us can be proud that they exist, but equally we recognize that we wouldn’t create a space program in order to get these collateral benefits. But NASA is transformative. We don’t just help develop new technologies, we inspire whole new industries, revolutionize existing ones, and create new possibilities. I often wonder if it might be possible to quantify the value to society of upgrading the standards of precision to which the entire industrial base of that society operates. Any company bidding on space projects – anyone who wants to be a subcontractor or supplier, who even wants 4to supply nuts, bolts and screws to the space industry – must work to a higher level of precision than human beings have ever had to do before. How do we value that asset? I don’t know, but I know that it is real. In a related vein, another benefit of space to the economy is the way it inspires people to go into the technology sector. People like Steve Jobs, Bill Gates, and Burt Rutan immediately come to mind, but it is more important to realize that a large number of technical professionals, in all fields, first got hooked on space and were then inspired to pursue technical careers. This is truly one of the best “spinoffs” we have, and the space exploration enterprise should receive due credit for it. At a time when we are concerned about declining enrollments in engineering, science, and mathematics, this should be no small factor in our thinking. Most of you know how the demands of spaceflight sparked the revolution in integrated circuitry. But we didn’t only get integrated circuits from the effort to master spaceflight, we got all of the other technologies that made them possible. These capabilities now permeate our entire industrial base, and the use of integrated circuits is so ubiquitous, in devices whose very existence would have been almost unimaginable only a few years ago, that we no longer even notice it. Cellphones are given away as a competitive inducement to select one wireless provider or rate plan over another. <Continued>

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<Continued>Devices that can store gigabytes of information, a capability once beyond price, are given away as keychain fobs in promotional advertising. Built into your checkbook can be a calculator that Newton or Gauss would have given years of their careers to have. For a few hundred dollars, you can buy a device that will allow you to navigate to any address in the country over any road on the map. And who even notices? Today, NASA is again among those at the forefront of microprocessor development, as evidenced by the recent demonstration of a Quantum Computer Chip – a device that operates at the limits of our understanding of the physical universe and makes use of the strange and elusive properties of quantum mechanics. Quantum computing won’t be just one more incremental improvement on present-day computing – it will revolutionize it. It’s the kind of breakthrough you get when you set the bar impossibly high, simply because the rigors of space exploration demand it. To stimulate economic growth, increase our international competitiveness, and create better lives for our citizens, we must stimulate technological innovation. NASA’s own programs accomplish this in one way, but as we have seen, the Space Economy today is much bigger than NASA and becoming more so. But NASA has another role to play, that of an important catalyst for new ideas and new technology by setting extraordinary goals and engaging the imagination and drive of entrepreneurs in the private sector.

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### A decline in US economic competitiveness shreds resilience and collapses the global economy

Mandelbaum– Professor and Director of the American Foreign Policy Program at Johns Hopkins – 2005 [Michael, The Case for Goliath: How America Acts As the World’s Government in the Twenty-First Century, p. 192-195]

Although the spread of nuclear weapons, with the corresponding increase in the likelihood that a nuclear shot would be fired in anger somewhere in the world, counted as the most serious potential consequence of the abandonment by the United States of its role as the world's government, it was not the only one. In the previous period of American international reticence, the 1920s and 1930s, the global economy suffered serious damage that a more active American role might have mitigated. A twenty-first-century American retreat could have similarly adverse international economic consequences. The economic collapse of the 1930s caused extensive hardship throughout the world and led indirectly to World War II by paving the way for the people who started it to gain power in Germany and Japan. In retrospect, the Great Depression is widely believed to have been caused by a series of errors in public policy that made an economic downturn far worse than it would have been had governments responded to it in appropriate fashion. Since the 1930s, acting on the lessons drawn from that experience by professional economists, governments have taken steps that have helped to prevent a recurrence of the disasters of that decade.5 In the face of reduced demand, for example, governments have increased rather than cut spending. Fiscal and monetary crises have evoked rescue efforts rather than a studied indifference based on the assumption that market forces will readily reestablish a desirable economic equilibrium. In contrast to the widespread practice of the 1930s, political authorities now understand that putting up barriers to imports in an attempt to revive domestic production will in fact worsen economic conditions everywhere. Still, a serious, prolonged failure of the international economy, inflicting the kind of hardship the world experienced in the 1930s (which some Asian countries also suffered as a result of their fiscal crises in the 1990s) does not lie beyond the realm of possibility. Market economies remain subject to cyclical downturns, which public policy can limit but has not found a way to eliminate entirely. Markets also have an inherent tendency to form bubbles, excessive values for particular assets, whether seventeenth century Dutch tulips or twentieth century Japanese real estate and Thai currency, that cause economic harm when the bubble bursts and prices plunge. In responding to these events, governments can make errors. They can act too slowly, or fail to implement the proper policies, or implement improper ones. Moreover, the global economy and the national economies that comprise it, like a living organism, change constantly and sometimes rapidly: Capital flows across sovereign borders, for instance, far more rapidly and in much greater volume in the early twenty-first century than ever before. This means that measures that successfully address economic malfunctions at one time may have less effect at another, just as medical science must cope with the appearance of new strains of influenza against which existing vaccines are not effective. Most importantly, since the Great Depression, an active American international economic role has been crucial both in fortifying the conditions for global economic well-being and in coping with the problems that have occurred, especially periodic recessions and currency crises, by applying the lessons of the past. The absence of such a role could weaken those conditions and aggravate those problems. The overall American role in the world since World War II therefore has something in common with the theme of the Frank Capra film It's a Wonderful Life, in which the angel Clarence, played by Henry Travers, shows James Stewart, playing the bank clerk George Bailey, who believes his existence to have been worthless, how life in his small town of Bedford Falls would have unfolded had he never been born. George Bailey learns that people he knows and loves turn out to be far worse off without him. So it is with the United States and its role as the world's government. Without that role, the world very likely would have been in the past, and would become a less secure and less prosperous place. The abdication by the United States of some or all of the responsibilities for international security that it had come to bear in the first decade of the twenty-first century would deprive the international system of one of its principal safety features, which keeps countries from smashing into each other, as they are historically prone to do. In this sense, a world without America would be the equivalent of a freeway full of cars without brakes. Similarly, should the American government abandon some or all of the ways in which it had, at the dawn of the new century, come to support global economic activity, the world economy would function less effectively and might even suffer a severe and costly breakdown. A world without the United States would in this way resemble a fleet of cars without gasoline.

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### Global nuclear war

Mead 09 Senior Fellow in U.S. Foreign Policy at the Council on Foreign Relations, Only Makes You Stronger, The New Republic, www.tnr.com/politics/story.html?id=571cbbb9-2887-4d81-8542-92e83915f5f8&p=2

The greatest danger both to U.S.-China relations and to American power itself is probably not that China will rise too far, too fast; it is that the current crisis might end China's growth miracle. In the worst-case scenario, the turmoil in the international economy will plunge China into a major economic downturn. The Chinese financial system will implode as loans to both state and private enterprises go bad. Millions or even tens of millions of Chinese will be unemployed in a country without an effective social safety net. The collapse of asset bubbles in the stock and property markets will wipe out the savings of a generation of the Chinese middle class. The political consequences could include dangerous unrest--and a bitter climate of anti-foreign feeling that blames others for China's woes. (Think of Weimar Germany, when both Nazi and communist politicians blamed the West for Germany's economic travails.) Worse, instability could lead to a vicious cycle, as nervous investors moved their money out of the country, further slowing growth and, in turn, fomenting ever-greater bitterness. Thanks to a generation of rapid economic growth, China has so far been able to manage the stresses and conflicts of modernization and change; nobody knows what will happen if the growth stops. India's future is also a question. Support for global integration is a fairly recent development in India, and many serious Indians remain skeptical of it. While India's 60-year-old democratic system has resisted many shocks, a deep economic recession in a country where mass poverty and even hunger are still major concerns could undermine political order, long-term growth, and India's attitude toward the United States and global economic integration. The violent Naxalite insurrection plaguing a significant swath of the country could get worse; religious extremism among both Hindus and Muslims could further polarize Indian politics; and India's economic miracle could be nipped in the bud. If current market turmoil seriously damaged the performance and prospects of India and China, the current crisis could join the Great Depression in the list of economic events that changed history, even if the recessions in the West are relatively short and mild. The United States should stand ready to assist Chinese and Indian financial authorities on an emergency basis--and work very hard to help both countries escape or at least weather any economic downturn. It may test the political will of the Obama administration, but the United States must avoid a protectionist response to the economic slowdown. U.S. moves to limit market access for Chinese and Indian producers could poison relations for years. For billions of people in nuclear-armed countries to emerge from this crisis believing either that the United States was indifferent to their well-being or that it had profited from their distress could damage U.S. foreign policy far more severely than any mistake made by George W. Bush. It's not just the great powers whose trajectories have been affected by the crash. Lesser powers like Saudi Arabia and Iran also face new constraints. The crisis has strengthened the U.S. position in the Middle East as falling oil prices reduce Iranian influence and increase the dependence of the oil sheikdoms on U.S. protection. Success in Iraq--however late, however undeserved, however limited--had already improved the Obama administration's prospects for addressing regional crises. Now, the collapse in oil prices has put the Iranian regime on the defensive. The annual inflation rate rose above 29 percent last September, up from about 17 percent in 2007, according to Iran's Bank Markazi. Economists forecast that Iran's real GDP growth will drop markedly in the coming months as stagnating oil revenues and the continued global economic downturn force the government to rein in its expansionary fiscal policy. All this has weakened Ahmadinejad at home and Iran abroad. Iranian officials must balance the relative merits of support for allies like Hamas, Hezbollah, and Syria against domestic needs, while international sanctions and other diplomatic sticks have been made more painful and Western carrots (like trade opportunities) have become more attractive. Meanwhile, Saudi Arabia and other oil states have become more dependent on the United States for protection against Iran, and they have fewer resources to fund religious extremism as they use diminished oil revenues to support basic domestic spending and development goals. None of this makes the Middle East an easy target for U.S. diplomacy, but thanks in part to the economic crisis, the incoming administration has the chance to try some new ideas and to enter negotiations with Iran (and Syria) from a position of enhanced strength. Every crisis is different, but there seem to be reasons why, over time, financial crises on balance reinforce rather than undermine the world position of the leading capitalist countries. Since capitalism first emerged in early modern Europe, the ability to exploit the advantages of rapid economic development has been a key factor in international competition. Countries that can encourage--or at least allow and sustain--the change, dislocation, upheaval, and pain that capitalism often involves, while providing their tumultuous market societies with appropriate regulatory and legal frameworks, grow swiftly. They produce cutting-edge technologies that translate into military and economic power. They are able to invest in education, making their workforces ever more productive. They typically develop liberal political institutions and cultural norms that value, or at least tolerate, dissent and that allow people of different political and religious viewpoints to collaborate on a vast social project of modernization--and to maintain political stability in the face of accelerating social and economic change. The vast productive capacity of leading capitalist powers gives them the ability to project influence around the world and, to some degree, to remake the world to suit their own interests and preferences. This is what the United Kingdom and the United States have done in past centuries, and what other capitalist powers like France, Germany, and Japan have done to a lesser extent. In these countries, the social forces that support the idea of a competitive market economy within an appropriately liberal legal and political framework are relatively strong. But, in many other countries where capitalism rubs people the wrong way, this is not the case. On either side of the Atlantic, for example, the Latin world is often drawn to anti-capitalist movements and rulers on both the right and the left. Russia, too, has never really taken to capitalism and liberal society--whether during the time of the czars, the commissars, or the post-cold war leaders who so signally failed to build a stable, open system of liberal democratic capitalism even as many former Warsaw Pact nations were making rapid transitions. Partly as a result of these internal cultural pressures, and partly because, in much of the world, capitalism has appeared as an unwelcome interloper, imposed by foreign forces and shaped to fit foreign rather than domestic interests and preferences, many countries are only half-heartedly capitalist. When crisis strikes, they are quick to decide that capitalism is a failure and look for alternatives. So far, such half-hearted experiments not only have failed to work; they have left the societies that have tried them in a progressively worse position, farther behind the front-runners as time goes by. Argentina has lost ground to Chile; Russian development has fallen farther behind that of the Baltic states and Central Europe. Frequently, the crisis has weakened the power of the merchants, industrialists, financiers, and professionals who want to develop a liberal capitalist society integrated into the world. Crisis can also strengthen the hand of religious extremists, populist radicals, or authoritarian traditionalists who are determined to resist liberal capitalist society for a variety of reasons. Meanwhile, the companies and banks based in these societies are often less established and more vulnerable to the consequences of a financial crisis than more established firms in wealthier societies. As a result, developing countries and countries where capitalism has relatively recent and shallow roots tend to suffer greater economic and political damage when crisis strikes--as, inevitably, it does. And, consequently, financial crises often reinforce rather than challenge the global distribution of power and wealth. This may be happening yet again. None of which means that we can just sit back and enjoy the recession. History may suggest that financial crises actually help capitalist great powers maintain their leads--but it has other, less reassuring messages as well. If financial crises have been a normal part of life during the 300-year rise of the liberal capitalist system under the Anglophone powers, so has war. The wars of the League of Augsburg and the Spanish Succession; the Seven Years War; the American Revolution; the Napoleonic Wars; the two World Wars; the cold war: The list of wars is almost as long as the list of financial crises. Bad economic times can breed wars. Europe was a pretty peaceful place in 1928, but the Depression poisoned German public opinion and helped bring Adolf Hitler to power. If the current crisis turns into a depression, what rough beasts might start slouching toward Moscow, Karachi, Beijing, or New Delhi to be born? The United States may not, yet, decline, but, if we can't get the world economy back on track, we may still have to fight.

## Contention 2: Solvency 1/4

### SHUTTLES ARE KEY TO THE SUSTAINMENT OF THE ISS

Hutcheson, Ashley. 2004. ((Ashley Hutcheson is Professor at the University of Illinois College of Law)"DOLLARS AND SENSE: WHY THE INTERNATIONAL SPACE STATION IS A BETTER INVESTMENT THAN DEEP SPACE EXPLORATION FOR NASA IN A POST-COLUMBIA WORLD ." JOURNAL OF LAW, TECHNOLOGY & POLICY 2. (2004): 318. Web.)jk

The United States serves as project manager for the ISS and has an obligation to its partners to give full attention to that position until construction is complete. The space station program manager for NASA, William Gerstenmaier, said he expects that at least twenty-eight more shuttle missions will be necessary to reach “international core complete,” the point at which all U.S. obligations are satisfied. Although all shuttle flights will be dedicated to the ISS until then, President Bush wants NASA to finish the ISS and retire the shuttle fleet by 2010. That ultimatum may be unreasonable. ISS project deadlines are continuously delayed because the Russian Soyuz and Progress crafts cannot fill the void of the much larger U.S. shuttles, and t3he earliest possible shuttle flight is July 2005. In addition, the partners are constantly faced with malfunctions on the ISS: environmental systems are degrading; exercise equipment vital to astronaut health is breaking; and a slow leak was found after too many astronauts used a hose as a handhold while looking out of an observation window, thereby cracking it. Most recently, the primary oxygen generator on the ISS was in disrepair and the resident astronauts began to run out of oxygen and food; however, the next Russian cargo vessel was not scheduled to launch for another three months. This is a perfect example of how desperately the ISS needs U.S. shuttles to supplement the Russian ships and bring adequate amounts of supplies to sustain the astronauts.

Contention 2: Solvency 2/4

### Shuttle is the ONLY option – it’s safer than alternatives and is uniquely key to human spaceflight and the ISS – many reasons

Smith, former manager of Shuttle Systems Engineering at NASA’s Johnson Space Center in Houston, 12/10/09 (Glenn, “Defining a Flexible Path to Human Space Exploration.)

Constellation’s Go-It-Alone approach is seriously underfunded. The budget crunch of the past few months has derailed President Bush’s plans to place a permanent base on the moon by 2020, and on to Mars. Instead of yearly increases, it is likely that NASA’s budget will be level (at best) for the foreseeable future. Instead of having a defined goal and a promise date, it is likely that NASA will be fortunate to get a commitment for something like 0.6% of the federal budget on a continuing basis. The challenge for the Committee will be to define a path forward that accomplishes the most with a given limited budget. Five Year Gap and Potential Consequences. If the shuttle is retired in 2010 and its replacement does not become available, the United States could possibly lose all ability to conduct Human Space Flight for one or more decades, except by paying Russia and other nations to launch US astronauts. Five years of this is much too long, let alone one or two decades. The general public is not yet aware that we are paying Russia to launch not only US astronauts, but other nations’ astronauts as well. We could be in for some serious criticism. This could happen in one of two ways, or a combination of the two. First, the American public could begin to lose interest in HSF during the planned five year gap in US launches, as they did during the five year gap between the Apollo-Soyuz mission in 1976 and the first Shuttle flight in 1981. Second, after Shuttle is retired, the Administration and the Congress could fail to add enough to the NASA budget to sustain Constellation. How likely is this to happen? Perhaps not likely, but more likely than another human space flight serious accident, and the consequence would be quite severe. We must remain positive, but consider potential problems. There is fear that support for Space Science would also decline if there are no US human launches for several years. This effect has been called “No Buck Rogers, No Bucks”. Public support for Space Science has always followed Human Space Flight activities. Develop a Cooperative International Plan for Human Exploration beyond earth orbit to the moon, asteroids or Mars. Such a program must be compatible with expected future NASA budgets, with major contributions by the international partners. Experience with past cooperative effort on the ISS will be valuable for this activity. It is important for the US to continue development of Orion, at least on the technology level, since it is probably the key US contribution to the cooperative international program for human exploration. Use the ISS to Support Exploration There are opportunities to use the ISS to develop ways to make a future human Mars mission safer, faster, and more efficient. This work could include recyclable water, ion and other advanced propulsion, electric power generation, better hygiene systems, recyclable environmental systems, in-flight repair techniques, and advanced robotics, among others, all expressly designed to be super reliable. The ISS would be a perfect test bed for those systems. Test and qualification of Mars modules at the ISS would be a fantastic and inspiring job for the ISS. A new Orion service module would contain all critical life support and propulsion systems and would be the crew living quarters on the long trip to Mars and back. A qualification test article could be built, and docked to the ISS. The hatch would remain closed, except in case of emergency, and the crew and systems would simulate a two-year flight to Mars and back. These would be viewed as a very important job for the ISS and would provide multiple opportunities for international participation. ISS and Shuttle are integral parts of the future Human Space Exploration program. To take full advantage of the ISS, Shuttle’s replacement would need some of the unique capabilities of the Shuttle: deliver large payloads to the ISS for replacement of large solar arrays; return even medium-size payloads for scientific examination or reuse; return defective whole modules for failure analysis or reuse; assemble large antennas for earth observations or demonstrations of future solar power satellites; service Hubble and other future platforms in earth orbit. If Shuttle is gone, we will be forced to operate in a crippled mode in LEO for a long, long time. Cease Spending on Ares5 and Altair. Since funding for the lunar portion of Constellation will probably not be available for a long time, Ares1/Orion, Ares5 and Altair would not be needed for a lunar mission until at least 2025 or later. That would provide time to re-evaluate the troubled Ares1 launcher for Orion and perhaps choose better alternatives for both Ares1 and Ares5. Shuttle Safety is not a problem The Shuttle would be safer than the Ares1/Orion for at least the first dozen or more flights of Ares1/Orion for the same reason that both Shuttle and Soyuz are now very reliable, having the experience of more than 100 flights each. The first few dozen flights of each revealed potential flaws which were then corrected before any could cause major accidents. Reported Shuttle anomalies have declined from an average of 50/flight on early flights to about 4/flight recently. Both Shuttle accidents were found to be the result of a combination of equipment design flaws and management lapses. Each of these problems has been corrected and will no longer be a threat. In a development and flight test program, experience is a most important factor. The Ares1/Orion escape system is not a panacea for all or even most major flight problems. Soyuz <continued>

Contention 2: Solvency 3/4

 <Continued> has had two major accidents where its escape system did not save the crews, and just one where its escape system saved the crew. It is unlikely that an escape system would have saved crews on either of the two Shuttle accidents. The success rate for escape systems is thus one out of three for the Soyuz and one of five overall if Shuttle is considered. Former NASA Administrator Mike Griffin, as part of his proclaimed “jihad” against the Shuttle, has produced a Probabilistic Risk Assessment (PRA) estimate that claims Ares1/Orion would be more that 10 times safer than Shuttle. However, Griffin’s PRA is known to be flawed, primarily because it assumes that nearly all failures are random and incorporates an escape system that would be reliable and effective. The random failure assumption was necessary to permit the PRA to combine failure statistics mathematically to produce a quotable overall safety number. No systems engineer that has had actual design and development experience believes that a failure in development flight testing is random. There is always a definite cause. Experienced development engineers are determined to find the cause and fix it. They reject any notion of random failures. The US National Transportation Safety Board (NTSB) also rejects the idea of random failures and does not rely on PRAs. The following illustrates a serious flaw in the PRA: Before an accident, a PRA will forecast a given (flawed) estimate of safety. After an accident, and after the cause has been determined and the problem has been fixed, the PRA will forecast lowered safety, when in fact, safety actually improved. The Shuttle Orbiter returns intact and uses expensive systems again and again, with complete inspection and sometimes minor overhaul after each flight. Each system and subsystem is re-certified “safe to fly” at a flight readiness review before each shuttle flight. Many people believe this meets the intent of the Columbia Accident Investigation Board recommendation to require re-certification if the Shuttle were to operate for a decade or more after 2010. A wild card is the uncertain future of the COTS program. Summary Recommendations: 1. Develop Cooperative International Program for Human Exploration and Utilization of ISS 2. Continue Orion technology development, funds available 3. Conduct trade studies to determine the best launcher for a future Orion 4. Extend Shuttle Orbiter to eliminate gap. Retain flexibility for replacement 5. Cease spending on Ares5 and Altair unless a major budget increase appears

### Lack of shuttles puts Russia in control of space – US power in space defines US power on Earth

Al Neuharth; USA TODAY Founder 7/26/02, “Russia rules space and we don't care”, found on lexis

KENNEDY SPACE CENTER, Fla. -- Thirty-three years ago this month we won the space race when Neil Armstrong stepped on the moon. July 20, 1969. The free world rejoiced with the USA. We beat the USSR, modern Russia's mother country and then the leader of the Communist world. That was then. This is now. The difference: \* Then, this was the gateway to the universe. We followed our lunar landings with a space shuttle program that led to huge technological breakthroughs. In communications, health, national security. \* Now, all our space shuttles are grounded. They are old and have cracks in them. Nobody knows when they'll fly again. As a result, one astronaut and two cosmonauts on the International Space Station have only Russian spaceships to rely on for supplies or a possible emergency trip back to Earth. In short, Russia now rules in space. What happened? Space exploration lost its "sex appeal" for our politicians. There no longer is a bad guy to beat up there. So Osama bin Laden and Saddam Hussein make better emotional targets. The Bush administration's lack of care about the space program was emphasized this week. Vice President Dick Cheney landed here amid secrecy aboard Air Force Two. Thousands of space workers were high with hope he would spotlight the importance of getting back into the space business. Instead, Cheney spent all day nearby at sea aboard the USS Wyoming, a nuclear submarine named after his home state. Not a nod nor a word about our crippled space program. What a difference from the days of John F. Kennedy. He understood that the nation which is No. 1 in space ultimately will be No. 1 on Earth.

Contention 2: Solvency 4/4

### The space shuttle must be kept until a better alternative is created

Chow, staff writer, space.com, 4/12/11 (Denise, “Why There's No Replacement for the Space Shuttle” http://www.space.com/11363-nasa-space-shuttle-replacement-30-years-anniversaries.html.)

 NASA's space shuttles are retiring this year, but America has no spaceship to replace them, leaving many to wonder: Why not? After the wheels of the space shuttle roll to a stop for the final time, NASA astronauts will have to rely on Russian spaceships for their rides into space until commercial American vehicles are ready to fly crews to orbit. A capsule-based spacecraft, called Orion, is also in development, but NASA's current plans are to use it primarily as an escape ship for the International Space Station. So why hasn't NASA already built a "Space Shuttle 2" – a more economical, more technologically up-to-date reusable space plane? Over the course of the shuttle program's 30-year career, NASA and its various partners explored a number of different vehicle options to succeed the space shuttles, but none were brought to fruition, said Roger Launius, space history curator at the Smithsonian's National Air and Space Museum, in Washington. "The landscape is littered with failed shuttle follow-on programs," Launius told SPACE.com. One by one, each program ended after development plans bumped up against funding and politics – an experience familiar throughout NASA's history. "There's a whole series of factors – some of them were political, but a lot of the problems were technical," Launius said. "Could they have been solved if they had more money? Probably. So, was it a technical problem or a political problem? I could argue both sides." Pushing further out into the solar system NASA is retiring its three remaining space shuttles to focus on future missions to an asteroid and eventually Mars. Meanwhile, the private sector has been charged with developing spacecraft to reach the International Space Station and other possible destinations in low-Earth orbit. Until then, there will be a gap in American spaceflight similar to the years between the end of the Apollo moon program and the inception of the space shuttles, said NASA's deputy chief Lori Garver. "NASA has relived this history quite a bit since Apollo," Garver told SPACE.com. "When we talk to our colleagues who are running space agencies around the world, we all struggle with, ‘How do you ramp up a new program while still operating the old one?’ And none of us have really found a way to do that without these gaps." Discovery, Endeavour and Atlantis could continue to fly beyond 2011 given the appropriate funds, but some experts agree that the vehicles' retirement is necessary to pave the way for the construction of more-sophisticated spacecraft, including ones to explore farther out into the solar system. "You could continue to fly the shuttle – in theory, it can be done," Launius said. "But is that the right thing to do, or has that train left the station? I think a lot of people would say it has probably left." For Wayne Hale, NASA's former space shuttle program manager, ending the shuttle program is the crucial next step to ensure that America's spaceflight program is constantly evolving. "There are other considerations beyond the money," Hale told SPACE.com. "Technology has advanced, and we need to build a new, safer, more economical next generation. Think what would happen if the Wright brothers said, 'Okay, the thing we built in 1903, it flew. We don't need to make any improvements, we'll just sell those.' The way you advance is by making improvements and building new vehicles and getting something more capable." Searching for a replacement Still, the various failed programs to succeed the space shuttles are examples of how difficult that can be. One example is the National Aerospace Plane, Launius said. In the 1980s, NASA and the Air Force collaborated on a highly secretive project known as the X-30 National Aerospace Plane (NASP). Due to the classified nature of the project, few details are known, but the concept was envisioned as a single-stage-to-orbit space plane. The program lasted over a decade, but technical hurdles and budgetary issues forced its eventual cancellation in 1993, before a prototype could be built. Other test programs that fell short include <Continued>

<Continued> the X-33, which was a joint development between NASA and Lockheed Martin in the mid-1990s. The X-33 suborbital space plane was planned as a technology demonstrator for Lockheed's proposed VentureStar orbital spacecraft. "This was another space plane concept, a potential shuttle follow-on, in which NASA and Lockheed both put money," Launius said. "But it was underfunded and there wasn't the political support for it. They again ran into technical problems, and no one was willing to open a pocketbook to solve those, and that program was canceled as well." Among other test programs, NASA experimented with a cargo-only version of the space shuttle, called Shuttle-C. This side-mounted carrier would be flown from the ground, unmanned, and used solely to ferry supplies into low-Earth orbit. "I went to work for NASA in 1990, and when I arrived there, this was one of the big things they were working on," Launius said. "It was essentially a modification to the shuttle, but it never got the approval necessary to move beyond the study phase." More than just a political fight There were reasons besides political and technical challenges that these test programs did not get much further than the design stage, Hale said. Ironically, one of them may have been the shuttles' reputation as workhorses, with their strong records of achievement. "My take on the reason we don't have a second shuttle is that the shuttle we have did its job too well," Hale said. "It was just good enough – it wasn't as economical as we wanted, and as we found out, not as safe as we wanted, but it was effective enough to never cross the threshold to the point where we said we needed to replace them." According to Hale, NASA should have been developing a second-generation space shuttle in the 1980s, long before the disastrous loss of the shuttle Columbia and President George W. Bush's unveiling in 2004 of a new vision that laid the foundation for the shuttles' retirement. However, "the policymakers just never saw the need, because the shuttle was doing everything just good enough that we could continue to get by," Hale said.

# 2AC Extensions

## Inherency Ext. 1/2

### Reliance on Russia now

Farrar, staff writer, CNN.com, quoting John Logsdon, director of the space policy institute at George Washington University, Howard McCurdy, a space expert at American University in Washington, and Bill Nelson, Florida senator, 8/14/08 (Lara, “Experts: Reliance on Russia makes NASA weak,” CNN, http://articles.cnn.com/2008-08-14/tech/nasa.russia.soyuz\_1\_international-space-station-russian-soyuz-space-program?\_s=PM:TECH.)

Experts are growing increasingly concerned that the United States will have to rely entirely upon Russia to take astronauts to and from the international space station for at least five years. Observers say the situation is all the more worrying as after NASA announced a delay in the launch of its next-generation Orion spacecraft. NASA's dependency upon the Russian Soyuz space capsules and rockets to carry astronauts to the station is the result of a five-year gap between the scheduled retirement of the shuttle in 2010 and the debut of its replacement in 2015. The agency had hoped it could narrow this gap by accelerating the initial launch of the craft to 2013 but announced Monday that because of inadequate funding and technical issues, the Constellation space program would not be ready for testing until September 2014. Although the new date is still within the March 2015 absolute deadline, many experts say NASA's reliance upon Russia to take astronauts into space has placed the agency in an unnecessary position. "It is a vulnerability," said John Logsdon, director of the space policy institute at George Washington University. "Any time you are relying on a single system to do a critical task, you are vulnerable if that system has problems. "It is our fault for not having a replacement for the shuttle much earlier than Orion will be available. It puts Russia in a very powerful position," Logsdon said. Although China has launched an astronaut into space in 2003, it still doesn't have the launching capabilities of the U.S. and Russia. But its space infrastructure is fast developing. According to Howard McCurdy, a space expert at American University in Washington, Russia will be the only country capable of providing human access to space not only for the Americans but for the rest of the world in the near future. "It is like a monopoly position where you are at the mercy of that supplier," McCurdy said. "You don't want to be dependent on a single provider, no matter who it is." McCurdy warned that because the United States has positioned itself to be completely dependent on Russia to get humans into space until 2015, it may be harder for the American government to take diplomatic action against the country, especially in light of recent tensions between Russia and Georgia. "That is a real concern," McCurdy said. "You are much more reluctant to be nasty with somebody who is a sole provider of an essential service. "We have other international arrangements with them that could be jeopardized by our reliance on them," McCurdy continued. "Everything from their foreign relations with ex-Soviet states to their role in economic summits." Does NASA's dependence on Russia bode badly for U.S. space program? For its part, NASA says it remains confident that diplomatic affairs between the two countries will not adversely impact the space agency's relationship with Russia. "While it is possible that government to government issues could potentially have an impact on other aspects of a relationship between nations <Continued>

Inherency Ext. 2/2

<Continued> including cooperative space exploration activities, NASA has no reason to believe that it will be unable to rely upon Roscosmos-provided Soyuz vehicles for future ISS activities," spokesman Michael Curie wrote in an e-mail statement to CNN. The threat of a breakdown in diplomatic relations is not the only one hanging over NASA's space program. Legislation passed in 2000 (now called the Iran, North Korea and Syria Nonproliferation Act) could soon bring an abrupt halt to NASA's partnership with the Russian Space Federation, Democratic Sen. Bill Nelson of Florida said. The law bans the United States from buying space technology from Russia unless the president determines that Russia is taking steps to prevent the proliferation of nuclear and missile technology to Iran. Congress waived the ban in 2005, allowing NASA to enter into a $719 million contract with the Russians for use of the Soyuz through 2011. NASA says it is renegotiating a new long-term contract for use of the Soyuz, but, according to Nelson, the success of that contract could depend on whether lawmakers decide to approve the waiver again. Election-year politics combined with increasing concerns about Iran and the ongoing crisis in Georgia all but guarantee that lawmakers will not vote for the exemption, Nelson said. That means NASA could lose access to the $100 billion space station unless it continues to fly the shuttle or strikes some sort of deal with another space agency willing to put forward money for additional Soyuz seats, the senator said. "It is a lose-lose situation," Nelson said. "If our relationship with Russia is strained, who knows if Russia will give us rides in the future?" Nelson asked. "Or if they give us rides, will they charge such an exorbitant price that it becomes blackmail?" Questions about the safety and reliability of the Soyuz have also been raised in recent months after two consecutive troublesome landings by space capsules, including in April with American astronaut Peggy Whitson on board. NASA has been working with Russian engineers to try to determine the cause of the dangerous descents but has failed come up with any concrete answers. But NASA officials say the space agency still believes that the Soyuz is a reliable transport system for its astronauts. "We do not have concerns," NASA spokesman Rob Navias said. "The Soyuz, which has been flying for decades now, is extremely reliable and is extremely capable." "We have been partnering with the Russians for decades now for space flights." The Russian Federal Space Agency, Roscosmos, could not be reached for comment on the matter.

## ISS Adv. Ext.

## Colonization Ext. 1/3

### US INVOLVEMENT IN THE ISS IS KEY FOR SPACE EXPLORATION

### Hauser, Marty. 2009. ((Marty Hauser is the VP of Research and Analysis of the Space Foundation)"The International Space Station: Decicion 2015." Space Foundation (2009): 13.)jk

The development of the ISS has already resulted in a number of important innovations with direct benefits to society. The station gives scientists the opportunity to conduct long-term microgravity research, an opportunity impossible to find elsewhere. It provides a test bed for space systems and for understanding the effects of long-term space flight upon humans – something that is critical for future human space exploration not only for the United States, but also for the world as a whole.

### ISS is critical for the development of science, exploration, and enterprise

Kitchmacher et al., NASA Johnson Space Center, Houston, TX, 5/24/05 (Gary H., “The international space station: A pathway to the future,” Acta Astronautica, 57, http://www.sciencedirect.com/science/article/pii/S0094576505001244.)

Since the Columbia tragedy, the ISS international partnership has allowed the ISS to continue fulfilling its mission to understand and protect our world, to explore the universe, and to inspire the next generation. NASA is embarking on a new and exciting chapter in space exploration. The new vision for spaceexploration calls for a sustained, achievable, and affordable human and robotic program to explore the moon, Mars and beyond. The ISS now plays an even more critical role in paving the way for human space exploration beyond low Earth orbit. The President has given NASA the goal to complete assembly of the ISS by the end of this decade and to refocus US research and use of the ISS on supporting spaceexploration goals, with emphasis on understanding how the space environment affects astronaut health and developing countermeasures and spacecraft systems, such as those for life support. The Space Station serves a wide variety of purposes. It is a micro gravity and life sciences laboratory, a test bed for new technologies in areas like life support and robotics, and a platform for astronomical and Earth observations. It is the cornerstone of the vision for space exploration. Assembling and operating the International Space Station has been producing advances in our knowledge about how we can live and work in space for long, continuous periods of time, and even the unfortunate loss of Columbia and Shuttle logistics support has been a tremendous lesson in how to support extended missions at planetary distances. The knowledge we are gaining is critical for our future journeys. NASA embodies the human spirit's desire to discover, to explore, and to understand. The Space Shuttle and International Space Station are not viewed as ends in themselves, but the means to achieving the broader goals of the nation's space program. Transportation and orbital facilities support and enable our efforts in science, exploration and enterprise.

Colonization Ext. 2/3

### IN-SPACE REFUELING ALLOWS SPACE CRAFT TO TRAVEL MUCH FARTHER AND MORE EFFICIENTLY

Augustine, Norman (Chairman of the U.S. Human Spaceflight Plans Committee). 2009. ("SEEKING A HUMAN SPACEFLIGHT PROGRAM WORTHY OF A GREAT NATION." 2 Review of U.S. Human Spaceflight Plans Committee (2009): 65. Web. <legislative.nasa.gov/396093main\_HSF\_Cmte\_Final Report.pdf>.)jk

Thus, an in-space refueling capability would make larger super-heavy lift vehicles even more capable, and would enable smaller ones to inject from low-Earth orbit a mass comparable to what larger launchers can do without in- space refueling. (See Figure 5.2.1-1.) In fact, the larger elements launched to low-Earth orbit tend to be propulsion stages, and these are usually about 80 percent fuel by mass. If there were the capability to fuel propulsion stages in space, the single-largest mass launched would be considerably less than in the absence of in-space refueling. The mass that must be launched to low-Earth orbit in the current NASA plan, without its fuel on board, is in the range of 25 to 40 mt, setting a notional lower limit on the size of the super heavy-lift launch vehicle if refueling is available. As an additional benefit of in-space refueling, the potential government-guaranteed market for fuel in low-Earth orbit would create a stimulus to the commercial launch industry beyond the current ISS commercial cargo-services market.

### Addressing human health problems is crucial to colonization

Christine E. Hellweg and Christa Baumstark-Khan, German Aerospace Center (DLR), ‘7 “Getting Ready for the Manned Mission to Mars: The Astronauts’ Risk from Space Radiation” Naturwissenschaften 94, no. 7 (1): 517-526. doi:10.1007/s00114-006-0204-0, p.

Over the next few decades, humans will most likely be exposed to different extraterrestrial scenarios (Horneck et al. 2003). The Moon base scenario will consist of a lunar human outpost on the South Pole with constant sunlight illumination and potential resources of water-ice deposits. It could follow a short-term Mars scenario of about 500 days with a 30-day stay on Mars or a long-term Mars scenario of about 1,000 days with a 525-day stay on the Mars surface. Indeed, a manned mission to Mars offers advantages that automated missions cannot provide. Humans, of course, can make their own decisions when it comes to acting on data. This is crucial, as data transmission from Earth to Mars and vice versa could take up to 40 min. For a safe mission to Mars, there are several environmental elements that need to be considered either individually or in combination. The most harmful environmental factors, which will continue to influence future manned space missions, are (1) cosmic ionizing radiation and secondary radiations produced by interaction of the cosmic primaries with atoms and molecules of the atmosphere or of the shielding material as well as the human body itself; (2) solar particle events (SPEs) that occur sporadically and may last more than several days, which cause temporally substantial increases in the radiation dose; (3) reduced gravity of 0.377×g on Mars’ surface, which is experienced by the crew after a trip in microgravity for nearly 1 year and a heavy g-load up to 6×g during landing.

Colonization Ext. 3/3

### THE ISS IS A STEPPING STONE TO SPACE EXPLORATION

Augustine, Norman (Chairman of the U.S. Human Spaceflight Plans Committee). 2009. ("SEEKING A HUMAN SPACEFLIGHT PROGRAM WORTHY OF A GREAT NATION." 2 Review of U.S. Human Spaceflight Plans Committee (2009): 56. Web. <legislative.nasa.gov/396093main\_HSF\_Cmte\_Final Report.pdf>.)jk

There is another important use of the ISS that was not considered when the space station was begun in 1984 or redesigned in 1992: to support exploration. The Committee believes that the Space Station can be a valuable testbed for the life support, environmental, and advanced propulsion technologies, among others, that will be needed to send humans on missions farther into space. It also has the potential to help develop operational techniques important to exploration. Such an emphasis has the advantage of keeping the technology development and operational side of NASA involved in ISS utilization.

## Micro G Research Ext. 1/3

### ISS key to microgravity research

Thirsk et al ‘09(Robert Thirsk, MDCM SM, Andre Kuipers, MD, Chiaki Mukai, MD PhD and David Williams, MDCM MSc, 6/9/11, “The space-flight environment: the International Space Station and beyond”, http://www.ecmaj.ca/cgi/content/full/180/12/1216)

The International Space Station is designed to serve as a research facility for low-gravity experimentation in fundamental science and technology development. Depending on which onboard systems are operating and the nature of crew activities, the acceleration environment on the station ranges from transient episodes of 0.01 g to quasi-steady levels below one-millionth of 1 g. 15 Perturbations in this environment occur during certain phases of orbital activity. Rendezvous and docking introduce transient accelerations that could be disruptive to certain experiments. In addition, on-board exercise devices could result in perturbations of the microgravity environment and are isolated (treadmill vibration isolation system) from adjacent structures. Rack isolation systems have also been developed to isolate critical experiments from transient vibrations and accelerations.

### ISS key to microgravity combustion and fluids research

NASA ’11 (National Aeronautics and Space Administration, 2/3/11, http://issresearchproject.grc.nasa.gov/FCF/)

The United States Laboratory Module on the ISS will contain the Fluids and Combustion Facility (FCF), designed and built at NASA Glenn Research Center in Cleveland, Ohio. The FCF is being developed to accommodate the unique challenges of working with fluids and combustion processes in microgravity, as well as to provide services and capabilities comparable to those found in traditional Earth-based laboratories. Glenn was an ideal choice for this project because of their reputation for award-winning research, particularly in the areas of fluids and combustion. as well as their long-standing experience in developing experiment hardware and world-class test facilities. Glenn engineers and scientists have been involved in designing, producing, and managing space-based hardware and facilities since the 1960's. As pioneers in rocket research, they had tested high-energy propellants even before the United States officially entered the space business. Glenn Research Center advanced the propulsion technology that helped make space travel possible. The Center's unique Zero Gravity Research Facility and other drop towers and laboratories were the source of foundational work in microgravity research. NASA's Zero Gravity Trainer aircraft, the KC-135, operates out of NASA Glenn several weeks each year in support of Glenn's ground-based microgravity research. Some flights include astronauts participating in crew training so they can have low-gravity experience with experiment hardware and materials prior to shuttle missions. In all, these facilities give Glenn a unique ability to develop and test microgravity experiments. Glenn Research Center is NASA's center of excellence for fluid physics and combustion science and has been responsible for 153 experiments on 47 flights. In addition to providing the new Fluids and Combustion Facility, they will be a major contributor to the investigations onboard the FCF, in gloveboxes, and in other ISS facilities. A forerunner of the FCF, the Glenn-developed Combustion-Module-1 (CM-1), which flew onboard the Shuttle Columbia, STS-83, in April, 1997, laid the groundwork for the combustion portion of the new Fluids and Combustion Facility with several hardware innovations.

Micro G Research Ext. 2/3

### Microgravity combustion research solves energy efficiency. Even small improvements have huge effects.

NASA ’08 (National Aeronautics and Space Administration, 5/20/08, “Unlocking Mysteries in Microgravity: NASA Glenn Provides the Keys With the Fluids and Combustion Facility”, http://www.nasa.gov/centers/glenn/about/fs07grc.html)

Combustion, or burning, is a process in which a substance reacts with oxygen to give off heat and light. Combustion meets almost 85% of the U.S. energy needs. While it does a good job of powering how we live on Earth, combustion is a major contributor to air pollution. The cost of combustion energy is about $450 billion each year in the U.S. In any area of the economy where a huge amount of money is spent, even the smallest improvements in efficiency can mean savings of very large amounts of money. A mere 1 percent increase in fuel efficiency, like improving your gas mileage from 25 miles per gallon to 25.25 miles per gallon, would translate into a savings to America of nearly 100 million barrels of oil a year (roughly $5.5 million per day at today's cost). Although today combustion is vital to transportation, materials processing, hazardous waste disposal, and many other areas, there is still only limited understanding of many of its fundamental characteristics. There are over 2,500 fatalities and tens of billions of dollars in property damage each year in accidental fires. Combustion research in microgravity can lead to advances in fire prevention, detection, and fighting. In addition, combustion research in microgravity can lead to more efficient use of energy, reduced pollution, and improved processes for making high-technology materials. Glenn Research Center's experience with jet engines provides a solid background in combustion and Glenn scientists have already begun to study combustion in space. A simple example of microgravity's effect in combustion is the behavior of flames in space. On Earth, hot air rises around a candle flame, which causes the flame to flicker and take on an elongated shape. In microgravity, however, no such distortion takes place. The flame, without the effects of gravity, has a steady, spherical, shape. The FCF allows researchers to study aspects of combustion, such as flame behavior, that are impossible to observe on the ground. Their research will lead to a better understanding of whole processes, such as soot production, which will aid development of improvements in fire fighting and pollution reduction.

### Microgravity fluids research key to technology

Space Studies Board ’01 (12/1/01, “The Mission of Microgravity and Physical Sciences Research at NASA”, http://www.nap.edu/openbook.php?record\_id=10252&page=4)

Fluids are ubiquitous in nature and in many industrial processes. Fluid motions are responsible for most transport and mixing that occur in the environment, in industrial processes, in vehicles, and in living organisms. Scientists studying basic problems from chaotic systems to the dynamics of stars also turn to fluid physics for their models. The goal of much of the fluid physics program is to comprehend the fundamental physical phenomena underlying flows observed in nature. Fluid physics also has a crucial role in the space program in support of the effort to develop new technologies or to adapt existing technologies. The fluid physics program encompasses five major research areas: interfacial phenomena, biological fluid dynamics, dynamics and instabilities, complex fluids, and multiphase flows and phase change. Interfacial phenomena include research directed at understanding capillary phenomena and the dynamics of fluids at contact lines that occur, for example, at solid-liquid-gas trijunctions. Biological fluid dynamics is a new area of emphasis and focuses on the underlying fluid physics and transport phenomena in biological and physiological systems. The study of dynamics and instabilities encompasses research topics ranging from fluid mechanics of star formation and Earth’s interior to the dynamics of electrically charged fluids. Complex fluids currently under investigation include fluids as diverse as colloids, foams, and granular aggregates. Multiphase flows and phase change involve investigations in two-phase flows, such as gas-liquid systems, in which gravity has a controlling influence on the flows due to the large density difference between the phases. The research in many of these areas is of relevance to the human exploration and development of space (HEDS) effort. For example, multiphase fluid flow experiments performed in microgravity are important for applications such as spacecraft thermal management, environment control, human life support, and power and propulsion systems.

Micro G Research Ext. 3/3

### Capillary Flow Experiments are critical to space exploration

NASA ’11 (National Aeronautics and Space Administration, 2/6/11, “Maintenance Work Area / ISS Research Project”, http://issresearchproject.grc.nasa.gov/MWA/)

The Capillary Flow Experiments (CFEs) are a suite of fluid physics flight experiments designed to investigate large length scale capillary flows and phenomena in low gravity. The CFE data to be obtained will be crucial to the Space Exploration Initiative, particularly as it pertains to fluids management systems such as fuels and cryogen storage systems, water collection and recycling, thermal control systems, and materials processing in the liquid state. NASA’s current plans for exploration missions assume the use of larger liquid propellant masses than have ever flown on interplanetary missions. Under low-gravity conditions, capillary forces can be exploited to control fluid orientation so that such large mission-critical systems perform more reliably. CFE is a simple fundamental scientific study that can yield quantitative results from safe, low-cost, short time-to-flight, handheld fluids experiments. The experiments aim to provide results of critical interest to the capillary flow community that cannot be achieved in ground-based tests such as tests to probe dynamic effects associated with a movingcontact boundary condition, capillary-driven flows in interior corner networks, and critical wetting phenomena in complex geometries. Specific applications of the results center on particular fluids challenges concerning propellant tanks. The knowledge gained will help spacecraft fluid systems designers increase system reliability, decrease system mass, and reduce overall system complexity.

## ISS Good

### The ISS is awesome (need a better tag)

Atkinson, Senior Editor, Universe Today, 2/14/08 (Nancy, “I Heart the ISS: Ten Reasons to Love the International Space Station,” http://www.universetoday.com/12815/i-heart-the-iss-ten-reasons-to-love-the-international-space-station/.)

It’s been called a white elephant, an orbital turkey, a money pit, and an expensive erector set. Seemingly, there’s even people at NASA who think building it was a mistake. The International Space Station has been plagued with repeated delays, cost overruns, and bad press. Additionally, the ISS has never really caught the fancy of the general public and most likely there’s a fair percentage of the world’s population who have absolutely no idea there’s a construction project the size of two football fields going on in orbit over their heads. But I’m going to be honest. I’ll come right out and say it: I really like the ISS. In fact, I’m crazy about it, and have been ever since Unity docked with Zarya back in 1998. Yes, my heart belongs to the space station, and since its Valentine’s Day, I’m going to profess my feelings here and now with ten reasons why I love the International Space Station: (In no particular order:) 1. International Cooperation. Didn’t your heart swell with pride for the Europeans when the Columbus science module finally became part of the station this week? And you gotta love the Canadians for their reliable, heavy-duty Canadarm. The Russians have been steady partners in station construction and re-supply for years now. Japan’s science lab will be added on the next shuttle mission. The ISS is the largest, most complex, international engineering project in history. In a world where violence and political animosity floods the daily news, it’s incredible that this structure is quietly being built by 16 different countries working together in relative harmony. If not for the international partners, the ISS probably wouldn’t have gotten off the ground. NASA Administrator Mike Griffin has said that the station’s most enduring legacy is the international partnership that created it. 2. Actually Building an Outpost in Space. The dream of almost every post-Apollo space enthusiast is to have a settlement or colony in space. As humble as it is, the ISS is exactly that. Humans have been living on board the station for over 7 years now. The experience of constructing and living aboard this complex structure in space is invaluable, and any future outpost will benefit from what’s been learned with the ISS. 3. The Personalities. Peggy Whitson, the first female station commander. Clay Anderson’s unique sense of humor. Suni Williams’ marathon and haircut for cancer patients. Mike Lopez-Alegria’s music. Mikhail Tyurin’s golf shot. Yuri Malenchenko’s wedding. Frank Culbertson’s September 11 perspective. Yury Usachev’s spinning antics. It goes all the way back to the three-way fist pump on Expedition One between Bill Shepherd, Sergei Krikalev, and Yuri Gidzenko. With the Expeditions lasting 4-8 months, we have the opportunity to get to know the astronauts and cosmonauts that live and work on board the ISS. If you watch the daily feeds from the ISS or listen to the periodic press conferences, you can become familiar with the different personalities of the station crews. The number one personality has to be Don Petit and his Saturday Morning Science. 4. You can see it almost every night. I’ve witnessed jaws dropping and eyes widening in wonder when people see the ISS for the first time gliding silently and swiftly across the night or early morning sky. I never tire of observing it. Find<Continued>

<Continued> out when the station will fly over your backyard at NASA’s website or at the Heaven’s Above website. 5. No major problems so far. One of the real impressive things about the ISS is that all the components, built by different countries and contractors have fit together perfectly. Yes, there have been intermittent computer issues, a faulty smoke alarm and the torn solar arrays. But these problems have all been resolved in short order. The damaged SARJ (Solar Alpha Rotary Joint) is a looming issue that could be problematic. But there are some first-rate engineering minds working on this matter, and it appears they have time to come up with a solution. The station has never had a major calamity or had to be evacuated in over 7 years of continuous human occupation. Knock on a Whipple Shield. 6. The general public can participate. Schools and informal education centers can conduct live question and answer sessions with space station crews. Middle school students can choose locations on Earth for the ISS crew to take pictures as part of the EarthKAM project. Ham radio operators can talk regularly with astronauts and cosmonauts with the ARISS (Amateur Radio on the ISS.) College students can design projects to be researched on board the station. And of course if you have $40 million in spare change you can ride to the ISS on a Soyuz as a spaceflight participant. 7. Finally, we have science officers. The other dream of every post-Apollo space enthusiast (and Star Trek fans) is to have science officers to conduct real scientific research. The ISS has had science officers since 2002, but science hasn’t been in the forefront of the work on board the ISS. Yet. 8. Long term research. The ability of the ISS to serve as a platform for science has come under fire. But what other lab has been expected to produce scientific results while still under construction? With the addition of the European and Japanese science labs, and the expected increase in crew size from three to six in 2009, scientific research, the original purpose of the station, will finally be able to be conducted with consistency. The microgravity environment of the ISS allows the study of long-term effects of weightlessness on the human body, crucial for any future human exploration on the moon and Mars. Research will help fight diseases such as diabetes, cancer, osteoporosis, and AIDS. The station provides a unique place to test technologies such as life support systems and new manufacturing processes, and gives us a long-term platform to observe and understand Earth’s environment and the universe. 9. Post docking fly-arounds. After each construction mission to the ISS, the shuttle’s post docking fly-around gives us a chance to see the new additions and latest configuration of the station. The astronauts say it’s a thrill to see how their handiwork on a specific mission fits into the big picture of the entire ISS, and it’s a thrill for us back on Earth to see the station’s new look, too. Plus the fly-around usually gives the shuttle pilot some actual stick time to fly the shuttle and a little time in the limelight. 10. What else would we be doing? Some people feel that the ISS’s tremendous budget has taken funds away from robotic exploration and other science. I can’t argue with that. But when it comes to human spaceflight, what else would we have been doing for the past 10-20 years? A space station was the logical next step after the shuttle. The main problem is that it took so long to decide on a plan, get it approved by Congress and get it in the works with international cooperation. But now, with construction and maintenance ongoing, we’re constantly and continually learning how to live and work in space. The ISS is a resource that will guide us on our future human endeavors in space. It’s more than just an obligation to finish and then be disregarded. The planning and funding for its future should encompass the maximum utilization of its fullest potential. In my eyes, the International Space Station is a thing of beauty, a work of art, an engineering marvel, and a constant companion that I watch for every night as it orbits our planet. The ISS should be given all the respect, and love, it deserves.

## Deorbiting 1/2

### CURRENTALY THE ISS CANNOT BE SAFELY DE-ORBITED

Augustine, Norman (Chairman of the U.S. Human Spaceflight Plans Committee). 2009. ("SEEKING A HUMAN SPACEFLIGHT PROGRAM WORTHY OF A GREAT NATION." 2 Review of U.S. Human Spaceflight Plans Committee (2009): 54. Web. <legislative.nasa.gov/396093main\_HSF\_Cmte\_Final Report.pdf>.)jk

Because of its unprecedented size and mass (about 350 mt on orbit), de-orbiting the ISS is not a simple task. (See Figure 4.2.2-3.) There are currently no existing or planned vehicles that could de-orbit the entire ISS in a predictable manner. Thus, either a new de-orbit module would have to be produced and launched to the ISS, or the station would have to be disassembled and the major portions de-orbited individually. The Committee requested an independent assessment of the difficulty of this task, and an estimation of the potential cost. The projected costs are $2 billion or more, depending on the method of de-orbiting required.

### INABILITY TO REPAIR THE ISS RISKS RE-ENTRY.

Christopher Kraft and Scott Spencer. 2011. ("Why we must save the space shuttle: If the Int'l Space Station is disabled, we need a rescue fleet." NYDailyNews.com. NY Daily News, 6/12/2011. Web. <http://articles.nydailynews.com/2011-06-12/news/29667814\_1\_international-space-station-russian-soyuz-space-crews>.)jk

For more than 10 years, space crews from the United States, Russia and other countries have successfully lived and worked year round, in six-month shifts, on the International Space Station, where they have conducted scientific research. In the coming years, that work will continue - but with a crucial safeguard missing: the space shuttle fleet that gives human beings a unique capability to fix the space station's guidance system and rocket thrusters in the event of a terrible failure. The shuttles are now about to retire - all of them, with no true replacements. This is an extremely dangerous development. Loss of control of the space station would mean a catastrophic reentry into the Earth's atmosphere of the massive structure - the largest object ever placed in orbit around the Earth, measuring over three football fields long and weighing more than 400 tons. The tons of falling debris that would survive reentry would pose an unprecedented threat to populated areas around the world. Such an international catastrophe would have significant ramifications for foreign relations and liability for the United States, Russia and the other countries who participate as partners on the space station.

Deorbiting 2/2

### WE NEED TO BE UTILIZING THE ISS FOR EXPLORATION AND RESEARCH

Hutchison, Bailey. 2005 ("International Space Station Research Benefits.” Senate Hearing 109. Opening Statements from HON. KAY BAILEY HUTCHISON, U.S. SENATOR FROM TEXAS. (2005): 1. Web. http://www.gpo.gov/ fdsys/pkg/CHRG-109shrg61670/html/ CHRG-109shrg61670.htm.)jk

I am committed to ensuring that the investment we have made as a nation in the International Space Station (ISS) is rewarded to the greatest extent possible by fulfilling the purposes for which it is designed. I think it is important that we not just say this is a tool for the Moon and Mars exploration-related research. I think the facility is capable of doing so much more for our Nation and for the world. I think we need to come back and look at the original purpose of the Space Station which was for scientific, industrial, engineering disciplines as well as Earth observation and supporting future exploration possibilities. So, I want to go back to the original concept of the Space Station and look for all of the ways that we can fully utilize it. And one of the things I want to talk to you about today is other scientific value that we might be able to gain from experimentation aboard the Space Station. So, we are looking today at the current state of planning for the International Space Station and also on the potential and the vital scientific research aboard this unique international laboratory.

## Research 1/4

### The ISS lab has resulted in medical breakthroughs and we have only have tapped into a portion of its power

Wolf, astronaut, medical doctor, and electrical engineer. Having traveled to space four times, Dr. Wolf participated in three short-duration space shuttle missions and a long-duration mission to the Russian Space Station Mir. A native of Indianapolis, he participated in seven spacewalks, and the SLS-2 Life Sciences Spacelab Mission, logging over 4,040 hours in space. He received the NASA Exceptional Engineering Achievement Medal, the NASA Inventor of the Year Award, among multiple recognitions for his work in advancing 3-D tissue engineering technology, 2/2/11 (David, “Tissue Engineering and the International Space Station,” http://blogs.nasa.gov/cm/blog/ISS%20Science%20Blog/posts/post\_1296681712918.html.)

On Earth, these bioreactors are unique in that they are able to emulate, within limits, the far superior fluid mechanical conditions achieved in space. One may think of this Space Bioreactor as a 3-D petri plate. The core of the instrumentation is a rotating fluid filled cylinder, the culture vessel, producing conditions inside resembling the buoyancy found within the womb. And much like in the human body, this vessel is surrounded by a life support system performing the functions of the heart and lung, achieving the precisely controlled conditions necessary for healthy tissue growth. The importance of this culture technique is that fluid mechanical conditions obtained in microgravity—and emulated on Earth—allow the growth of tissues in the laboratory that cannot be grown any other way. Emulated microgravity on Earth, and to a much greater degree, the actual microgravity of spaceflight enable an extremely gentle and quiescent fluid dynamic environment. The cells and substrates are free to organize into 3-D tissues without the need to introduce disruptive suspension forces from blades or stirring mechanisms. This leads to a broad array of applications based on enhanced in-vitro tissue culture techniques. The ground-based versions of the Space Bioreactor produced very high fidelity colon tumors for cancer research, providing strong indications of the value of actual microgravity, see Figure 1. Even so, when I first put space grown tissue samples under the microscope, while aboard the Space Station Mir, I was astounded! In my many years of experience culturing tissues, I had never seen any so well organized, so healthy, and with such fine structure. Nerve derived tissue from the adrenal gland was forming long fronds of exceptionally delicate tissue, see Figure 2. What I was seeing could never form on Earth, even in our state-of-the-art systems that emulate microgravity. NASA research in the Space Bioreactors produced over 25 U.S. patents and the technology is considered state-of-the-art for ground-based tissue culture. Scientists around the globe from the National Institutes of Health or NIH, medical centers, and universities have produced numerous peer reviewed publications in highly respected journals and even more patents based on the fundamental principles. Other actual spaceflight research has been successfully used to study breast cancer and prostate cancer. NASA has licensed its patents to spin-off companies including Synthecon, Inc., for commercial manufacturing of the equipment, and Regenetech, Inc., for regenerative medicine and stem cell applications. These companies have in turn sublicensed the technology even more broadly, enabling widespread use of this NASA-developed technology. Researchers on Earth use this technology to study cancer, stem cells, diabetes, cartilage growth, nerve growth, skin, kidney, <Continued>

Research 2/4

<Continued> liver, heart, blood vessels, infectious disease—virtually every tissue in the body. The applications go much further than engineering implantable tissue, to include vaccine production and living ex-vivo organic life support systems, such as artificial livers. Researchers at the NIH, for instance, used the methods to propagate the HIV virus, responsible for AIDS, in artificial lymph node tissue—itself sustained in the bioreactor. This resulted in the ability to study the virus life cycle under controlled conditions, outside the human body. But we are not done. While very capable on Earth, the performance of Earth-bound bioreactors is still limited by the presence of gravity. Spaceflight testing on Mir and the space shuttle demonstrate that the growth of larger, better functioning, and more organized tissue may be obtained under true low gravity conditions. To date, the Space Bioreactor has been exploited primarily for basic research. During the intervening time, the field of medicine has evolved a firm vision towards true regenerative tissue technology. In recent years, powerful molecular biology techniques provided a detailed biological knowledge, which permits understanding cellular machinery almost like micro-machines. This convergence of technology with the space station laboratory opens a new chapter for space biotechnology. The International Space Station National Laboratory now provides an unprecedented opportunity to the biotechnology community. Within NASA, scientists continue to work to build the infrastructure to enable the biotechnology community; to help them take the next steps in exploiting controlled gravity in-vitro systems. The vision is to team together the very best minds and institutions, leveraging their abilities to advance regenerative medicine. Such advances can lead to improving our quality of life on Earth and serve as a lasting legacy of the space station era.

Research 3/4

### The ISS allows for unique medical research opportunities

Reynolds, National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS), 4/8/09 (Trish, Biomedical Researchers Invited to Design Experiments for the International Space Station, National Institutes of Health, http://www.nih.gov/news/health/apr2009/niams-08.htm.)

The National Institutes of Health and the National Air and Space Administration are partnering to conduct biomedical experiments that astronauts could perform on the International Space Station. In a notice to scientists at universities, medical centers, and companies across the United States, the NIH announced its willingness to fund highly meritorious biomedical experiments that could utilize the unique environment in space and produce breakthroughs to improve human health on Earth. The International Space Station provides a special microgravity and radiological environment that Earth-based laboratories cannot replicate. Congress, recognizing the immense promise the facility holds for American-led science and technology efforts, opened the U.S. portion of the International Space Station to other federal agencies and university and private sector researchers when it designated the U.S. resources as a National Laboratory in 2005. The NIH solicitation is the next step in a new partnership to apply the National Laboratory to research that complements NASA’s space exploration efforts. "As the primary federal agency for conducting and supporting medical research, the NIH looks forward to facilitating access to our nation’s life sciences laboratory in space," said Stephen I. Katz, M.D., Ph.D., director of the NIH’s National Institute of Arthritis and Musculoskeletal and Skin Diseases, and NIH liaison to NASA. Already, biomedical experiments conducted on the International Space Station have addressed how bone and muscle deteriorate, how humans fight infectious disease, and how cancers grow and spread. "The ISS is an extraordinarily capable laboratory in a unique environment that has not previously been available for widespread medical research. NASA strongly supports the NIH’s leadership in this promising opportunity," said Mark Uhran, NASA’s assistant associate administrator for the International Space Station. The NIH-NASA program will encourage a new cadre of health researchers from a variety of disciplines to incorporate the space environment into their experiments, and will support them as they prepare their experiments for launch and analyze their data following a mission. "The diversity of NIH institutes and centers that agreed to participate in the initiative underscores the promise the International Space Station holds for human health," Katz continued. "We encourage all biomedical researchers in the United States — particularly those who are interested in molecular or cellular biology, biomaterials, or telemedicine — to give serious thought to how International Space Station facilities might answer their most pressing questions about how to benefit life on Earth." Former astronaut and Senator Harrison H. "Jack" Schmitt, who strongly supported the new partnership’s development when he was chairman of the NASA Advisory Council, applauded the initiative: "The NIH and NASA have a long history of collaboration, and this announcement builds on that foundation to leverage the American public’s investment in space-related health research and its implications for a much deeper understanding of human physiology." In addition to NIAMS, other sponsors of the announcement include the National Cancer Institute (NCI), the National Center for Research Resources (NCRR), the National Heart, Lung, and Blood Institute (NHLBI), the National Institute on Aging (NIA), the National Institute on Alcohol Abuse and Alcoholism (NIAAA), the National Institute of Biomedical Imaging and Bioengineering (NIBIB), the National Institute of Child Health and Human Development (NICHD), and the National Institute of Neurological Disorders and Stroke (NINDS).

Research 4/4

### THE ISS IS KEY TO ADVANCING THE REALISTIC GOALS OF BIOLOGICAL RESEARCH

Hutcheson, Ashley. 2004. ((Ashley Hutcheson is Professor at the University of Illinois College of Law)"DOLLARS AND SENSE: WHY THE INTERNATIONAL SPACE STATION IS A BETTER INVESTMENT THAN DEEP SPACE EXPLORATION FOR NASA IN A POST-COLUMBIA WORLD ." JOURNAL OF LAW, TECHNOLOGY & POLICY 2. (2004): 317-318. Web.)jk

President Bush wants NASA to limit its research on the ISS to his administration’s space exploration goals, including the impact of long- term space travel on humans. While that is certainly one potentially fruitful area of research, it is myopic and a disgraceful underutilization of the ISS. Considering the immense work undertaken by the United States to plan and build the space station with its international partners, NASA should continue to do research that can improve life on Earth. Humans are more likely to find a cure for cancer in the beneficial antigravity environment of the ISS than to build a hotel on Mars in the next few decades. President Bush’s plan forces a schedule upon NASA, much as past administrations have done to the detriment of the NASA culture and the crews of the Challenger and the Columbia. The first launch since the Columbia tragedy has already been pushed back multiple times due to NASA’s unflinching resolve to implement the CAIB recommendations before another launch, as well as to hurricanes and other problems beyond human control. There are too many unpredictable elements in space flight for the government to establish hard and fast schedules or expectations, and it should have patience if it truly wants to improve safety practices at NASA, which is crucial to developing successful new technology.

# Primacy Adv. Ext.

## Heg Ext. 1/8

### The space shuttle is reliable, flexible, state-of-the-art, and is key to US hegemony

Launius, Chief Historian for the National Aeronautics and Space Administration, 2003. (R.D., “Evolving Public Perceptions of Spaceflight in American Culture,” Acta Astronautica 53.)

In contrast to the lukewarm support the public showed for the efforts to land Americans on the Moon, as shown in Figure 5, the public has consistently agreed that the Space Shuttle is a good investment (see Figure 7). That does not directly translate, however, into willingness on the part of the public to fly in space, as shown in Figure 8. While it is not specifically tied to these public perceptions, some interesting conclusions may be offered about the Space Shuttle program based on these sources and other data. First, and certainly most significant, most agree that the Space Shuttle is a magnificent machine. A massively complex system—with more man 200,000 separate components that must work in synchronization with each other and to specifications more exacting than any other technological system in human history— the Space Shuttle must be viewed as a triumph of engineering and excellence in technological management. Because of its technological magnificence, the Space Shuttle has become an overwhelmingly commanding symbol of American excellence for the world community. Ask almost anyone outside the United States what ingredients they believe demonstrate America's superpower status to the world, and they will quickly mention the Space Shuttle—as well as NASA's larger space exploration program—as a constant reminder of what Americans can accomplish when they put their minds to it. Second, the Space Shuttle has been remarkably reliable over the course of its operational history. One exceptionally catastrophic accident, the Challenger explosion that killed the crew of seven on January 28, l986, ruins an otherwise exceptional reliability record. Without minimizing bat tragic accident, one is compelled to conclude that the vehicle has been significantly improved since 1986 as NASA engineers worked to correct design flaws and develop more effective operational procedures. Upgrades to many components of the Space Shuttle and organizational changes to the management system have led to the implementation of a strikingly more reliable vehicle than was lying in 1986. The shuttle is the most reliable launch system now in service anywhere in me world, with a success-to-failure ratio of greater man. Third, the Space Shuttle is also a mature system at this point in its career and that is an important factor in the quality of its performance over the last several years. At the end of the twentieth century, the Space Shuttle appropriately enjoys many of the same plaudits and suffers from some of the same criticisms that have been made clear since not long after the program first began. It remains the only vehicle in the world with the dual capability to deliver and return large payloads to and from orbit The design, now more than two decades old, is still state-of-the-art in many areas, including computerized flight control, airframe design, electrical power systems, thermal protection system, and main engines. Finally, the Space Shuttle has proven itself one of the most flexible space vehicles ever flown. Most assuredly, the range of possibilities for operations on-orbit expanded dramatically with the launch of Columbia in 1981. With its large payload bay, satellite deployment, capture and return to Earth, and repair and redeployment all for the first time became possibilities once the shuttle first flew. Requirements to perform these tasks have ensured that the crew of every shuttle mission has a much broader range of required activities it than the pioneering astronauts of the Mercury, Gemini, Apollo, and even the Skylab programs.

Heg Ext. 2/8

### Space dominance is key to hegemony

Posen, Ford International Professor of Political Science at MIT, Director of the MIT Security Studies Program, 2003 (Barry R., “Command of the Commons: The Military Foundation of U.S. Hegemony,” International Security 28, no. 1.)

The U.S. military currently possesses command of the global commons. Command of the commons is analogous to command of the sea, or in Paul Kennedy’s words, it is analogous to naval mastery. The commons, in the case of the sea and space, are areas that belong to no one state and that provide access to much of the globe. Airspace does technically belong to the countries below it, but there are few countries that can deny their airspace above 15,000 feet to U.S. warplanes. Command does not mean that other states cannot use the commons in peacetime. Nor does it mean that others cannot acquire military assets that can move through or even exploit them when unhindered by the United States. Command means that the United States gets vastly more military use out of the sea, space, and air than do others; that it can credibly threaten to deny their use to others; and that others would lose a military contest for the commons if they attempted to deny them to the United States. Having lost such a contest, they could not mount another effort for a very long time, and the United States would preserve, restore, and consolidate its hold after such a fight. Command of the commons is the key military enabler of the U.S. global power position. It allows the United States to exploit more fully other sources of power, including its own economic and military might as well as the economic and military might of its allies. Command of the commons also helps the United States to weaken its adversaries, by restricting their access to economic, military, and political assistance. Command of the commons has permitted the United States to wage war on short notice even where it has had little permanent military presence. This was true of the 1991 Persian Gulf War, the 1993 intervention in Somalia, and the 2001 action in Afghanistan.

### US INVOLVMENT IN THE ISS INCREASES US HEG

Hauser, Marty. 2009. ((Marty Hauser is the VP of Research and Analysis of the Space Foundation)"The International Space Station: Decicion 2015." Space Foundation (2009): 13.)jk

The ISS program has created a wide range of benefits and will continue to produce high-value research results. It allows the United States to show its technological leadership on a highly visible international endeavor, thus increasing its prestige and soft power. It helps the United States foster better relationships with international partners and gives the United States the opportunity to prove itself as a trustworthy partner in complicated, long-term commitments.

Heg Ext. 3/8

### The space shuttle is key to US space leadership

Synder, aerospace engineer on the space shuttle program in Houston, 5/17/10 (Mike, “This is no Time to Retire Shuttle,” www.spacenews.com.)

I am not a government employee, the CEO of an aerospace company or even senior management. I am an engineer, one of the tens of thousands of people around this nation who work daily on our efforts in space. In six months, the United States will retire the space shuttle, the most robust and capable space vehicle the world has ever seen, simply because our government has decided to do that. We have no vehicle to replace the space shuttle, and we will have no replacement for an unspecified amount of time. This is an enormous strategic mistake that requires serious reconsideration from all levels of government. Anything less will result in the U.S. surrendering its leadership role in human spaceflight for the foreseeable future. Unique, valuable skills, experience and knowledge will be lost as the work force has no other choice but to disperse. Ironically, the international space station, our $100 billion investment a quarter of a century in the making, is just nearing completion, and President Barack Obama is proposing to extend its mission until at least 2020. With the impending cancellation of the space shuttle program, there is little foresight and even less of a concrete plan on how we can fully utilize the space station to ensure it becomes everything that it can be and was promised to be. The fact is the space station was designed and always intended to be supported by the space shuttle in addition to unmanned cargo vehicles supplied by Russia, Europe and Japan. These cargo vehicles cannot completely replace the unique capabilities of the space shuttle and were always intended to act as a supplement. With the shuttle gone, the United States will be reliant on a foreign power, Russia, and its Soyuz spacecraft for an unspecified amount of time to transport astronauts to the space station, so heavily funded by the American people. For this service, Russia will be charging the United States approximately $50 million per seat. Per the space station agreement with our international partners, the United States transports European, Japanese and Canadian astronauts to the station on the space shuttle, since they have no crew capability of their own. Of course retirement of the shuttle does not nullify that agreement, and the American taxpayer will now also be paying Russia for the transport of our European, Japanese and Canadian partners as well. Compounding this problem is the fact Russia has signaled the price per seat will likely continue to increase as time goes forward. The United States will have no choice but to pay whatever Russia decides to charge, because, after all, we will have given Russia a monopoly and with that surrendered a part of our national sovereignty.

Heg Ext. 4/8

### ABANDONING THE ISS WOULD DAMN THE US’s ROLE AS A LEADER ON THE FINAL FRONTIER

Hauser, Marty. 2009. ((Marty Hauser is the VP of Research and Analysis of the Space Foundation)"The International Space Station: Decicion 2015." Space Foundation (2009): 6.)jk

If the United States allows its leadership of the ISS program to expire in 2015, it will likely fuel negative international perceptions of U.S. capabilities, reliability, and leadership. The nation’s inability to lead the ISS to the end of its design life would reflect poorly on U.S. commitment to scientific and technical endeavors. Although unlikely, it is possible that international partners would continue to operate the ISS, even if the United States abandons its investment in the project. The image of the United States is likely to suffer as it retreats from the leadership role on the largest international technical project ever undertaken. As the Review of U.S. Human Space Flight Plans Committee describes the situation, “Not to extend [ISS] operation would significantly impair U.S. ability to develop and lead future international spaceflight partnerships.”15 In addition, leaving the program would result in an unprecedented retrenchment: the United States abandoning a National Laboratory to other nations. Reduced to the role of a bystander, the nation would no longer benefit from the cutting-edge research and international collaboration conducted by other nations.

Heg Ext. 5/8

### Retirement of shuttles and failure to commit to the ISS undermines US primacy

Hall, thesis for the degree of master of arts, University of Florida, 2006 (Ryan, “Multilateral Agreements in the Space Sector”)

The ISS funding debacle also leads into the last argument, that of the US primacy of the space environment industry. The hegemony and its effect on the first two case studies is unmistakable. Its presence was one of the main factors driving the integration of the ESA, and it was allowed to participate in the IACG without even having a probe involved in the study. The primacy is a little less unequivocal in the last 15 years though. The ISS example as well as the ISPM example show how fickle the men and women who write the checks in the US government can be. While the US is still the dominant partner in the arrangement, the program is not what US administrators would have in an ideal policy world. This has allowed several other players particularly the European market, to make big steps forward in competition with the US. The recent grounding of the Space Shuttle fleet has exacerbated this notion considerably, both functionally and symbolically. There is simply no question that the US holds a relatively smaller percentage of the market now than it did 15 years ago. This raises another important question. Is the US space program as strong as its financier’s support, or has it lost some of the competitive edge that helped it define the first 40 years of space flight? Currently, US officials pursue policies as if neither is the case. Although the US is currently without a dependable entry vehicle, President Bush’s vision for the future of the US space program includes both missions to the Moon and Mars. Additionally, NASA insists that any hardware needed for the transportation of the trip must remain solely the responsibility of the US due to strategic reasons. The other ISS partners have been left in precarious position following the grounding of the Shuttle fleet. They are moving away from a dependence on NASA and have begun to develop their own joint reusable entry vehicle for access to the ISS. The fallout from the Columbia disaster could be the blow ends the US primacy in space. While it will has not significantly slowed NASA’s exploration efforts, it may have a different affect. It may in fact be a powerful enough wake-up call as to illustrate the fallibility of such a system and rally the other major players worldwide to do something about it. Only time will tell if NASA’s leading role in the space industry in the 20th century will continue into the 21st century.

Heg Ext. 6/8

### Maintenance of space primacy is key to technological advancement

Logdson, Director of the Space Policy Institute of George Washington University’s Elliott School of International Affairs in Washington, DC, 2003. (John M., “Reflections on Space as a Vital National Interest,” Astropolitics, http://www2.gwu.edu/~spi/assets/docs/space\_as\_a\_national\_interest.pdf.)

Space is often compared to the high seas, as they share numerous commonalities, such as exploration and international law. It even captures the human imagination today much as the high seas excited generations of explorers like Leif Erickson, Ferdinand Magellan, and James Cook. If the comparison between space and the high seas holds, lessons can be learned from analyzing how a naval superpower, Britain, maintained her status during the latter half of the nineteenth century, a period of great technological change. For the better part of two centuries, the British Royal Navy ruled the high seas virtually unchallenged, dominating the next two largest navies, the French and Spanish, in engagement after engagement. The Royal Navy projected British power to contain threats in Europe and abroad, ensured the flow of commerce from India, Asia, Africa and the Americas, and extended British colonial expansion and control. With such a high dependence on naval power, how did the British protect their lead? Following the advantages gained by the British during the eighteenth century, they rapidly moved to ensure their continued dominance. Lacking a true rival in the last half of the nineteenth century, the British took full advantage of their superiority in shipbuilding and design. In less than twenty years they moved from the wooden man-of-war that had dominated the high seas for centuries, to ironclads and battleships that held naval dominance well into the twentieth century. Lack of an immediate threat and direct competition allowed the British to use their industrial base to ensure a technological lead. They were able to build “sample fleets,” test them in real environments, choose what worked best, and discard the rest. The British technological advantage in industrial capacity and design also brought about the age of great luxury lines with ships like the Queen Mary. How does this model of technological domination relate to U.S. space systems? In his book … the Heavens and the Earth, Walter McDougall relates the story of the early days of the American space program, writing “The technocratic model triumphed under Presidents Kennedy and Johnson. Four months after taking office, Kennedy asked Congress to commit the United States to go to the moon.… Space technology was drafted into the cause of national prestige. Later, advanced technology in general was tapped as the vehicle for national and international regeneration.” One could argue that America is following the example of the Royal Navy, in that she is rapidly moving ahead despite the lack of direct competition or nation-state threat. Two examples, one in the area of navigation and the other in surveillance, best address the potential for American technological domination of space.

Heg Ext. 7/8

### Scrapping the space shuttle will cause the U.S. to fall irrevocably behind competitors in space, undermining global leadership.

Wolf 10

(Frank Wolf, Congressman for Virginia. 4-28-10. “Don’t Forsake U.S. Leadership in Space.” http://culberson.house.gov/space-news-frank-wolf-dont-forsake-u-s-leadership-in-space/)

Space exploration has been the guiding star of American innovation. The Mercury, Gemini, Apollo and shuttle programs have rallied generations of Americans to devote their careers to science and engineering, and NASA’s achievements in exploration and manned spaceflight have rallied our nation in a way that no other federal program — aside from our armed services — can. Yet today our country stands at a crossroad in the future of U.S. leadership in space. President Barack Obama’s 2011 budget proposal not only scraps the Constellation program but radically scales back U.S. ambition, access, control and exploration in space. Once we forsake these opportunities, it will be very hard to win them back. As Apollo astronauts Neil Armstrong, Jim Lovell and Gene Cernan noted on the eve of the president’s recent speech at Kennedy Space Center, Fla.: “For The United States, the leading space faring nation for nearly half a century, to be without carriage to low Earth orbit and with no human exploration capability to go beyond Earth orbit for an indeterminate time into the future, destines our nation to become one of second or even third rate stature.”In terms of national security and global leadership, the White House’s budget plan all but abdicates U.S. leadership in exploration and manned spaceflight at a time when other countries, such as China and Russia, are turning to space programs to drive innovation and promote economic growth.Last month, China Daily reported that China is accelerating its manned spaceflight development while the U.S. cuts back. According to BaoWeimin with the Chinese Academy of Sciences, “A moon landing program is very necessary, because it could drive the country’s scientific and technological development.”In a recent special advertising section in The Washington Post, the Russian government boasted of its renewed commitment to human spaceflight and exploration. Noting the White House’s recent budget proposal, the piece said, “NASA has long spent more money on more programs than Russia’s space agency. But President Barack Obama has slashed NASA’s dreams of going to the moon again. … At the same time, the Russian space industry is feeling the warm glow of state backing once again. There has been concerted investment in recent years, an investment that fits in well with the [Vladimir] Putin doctrine of trying to restore Russian pride through capacity.”Manned spaceflight and exploration are one of the last remaining fields in which the United States maintains an undeniable competitive advantage over other nations. To walk away is shortsighted and irresponsible. Our global competitors have no intention of scaling back their ambitions in space.James A. Lewis with the Center for Strategic and International Studies recently said that the Obama administration’s proposal is “a confirmation of America’s decline.”The 2011 budget proposal guarantees that the United States will be grounded for the next decade while gambling all of our exploration money on unproven research-and-development experiments. Although I am an ardent supporter of federal R&D investments, I believe it is unacceptable that the administration would gamble our entire space exploration program for the next five years on research.The dirty little secret of this budget proposal is that it all but ensures that the United States will not have an exploration system for at least two decades. That is a fundamental abdication of U.S. leadership in space — no matter how much the administration tries to dress it up. Our international competitors are not slowing down, and neither should we.

Heg Ext. 8/8

### Global nuclear war

Arbatov 7 (Alexei, Member – Russian Academy of Sciences and Editor – Russia in Global Affairs, “Is a New Cold War Imminent?”, Russia in Global Affairs, 5(3), July / September, <http://eng.globalaffairs.ru/numbers/20/1130.html>)

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

## Econ Ext. 1/2

### US shuttles key to econ – 12 million jobs in aerospace

The Daytona Beach News-Journal ’11 (2/25/11, “Space mission still crucial for nation, Volusia County”, http://www.news-journalonline.com/opinion/editorials/n-j-editorials/2011/02/25/space-mission-still-crucial-for-nation-volusia-county.html)

Even so, NASA is in the midst of a painful transition. When the federal government ended future funding for the space shuttle program, the pain was felt in Volusia County. As many as 250 Volusia County workers and a total of 9,100 Floridians work for the shuttle program. Last November, about 1,000 workers at the Kennedy Space Center were laid off. As many as 7,000 workers, mostly private sector workers associated with the shuttle program, may have to move on. That is a sobering statistic. But the space program based at the center must go on, and not just because the space center is crucial to the regional economy. The United States cannot afford to become a second-rate power in space exploration and space technology. In the 1950s, when the Soviet Union beat the United States into space by launching Sputnik, the nation rose to the challenge. Our leaders looked to the moon and said, "We will beat you in getting there." And we did. Now, the Soviet Union is gone, but the role of space in our telecommunications and economic development is greater than ever. Science, research and commerce are the new factors driving space exploration. Volusia County has a more personal connection with the space program. Discovery astronauts Alvin Drew and Nicole Stott are graduates of Embry-Riddle Aeronautical University. Four other ERAU graduates have been astronauts. It's not simply a feather in the area's cap. The aerospace industry -- from airplanes to shuttles -- accounts for 12 million U.S. jobs and about 5.6 percent of the gross domestic product, according to Christina Frederick-Recascino, ERAU vice president for research and institutional effectiveness

Econ Ext. 2/2

### US shuttles key to econ – many reasons

SCOTT SPENCER and CHRISTOPHER C. KRAFT JR. ‘10 (Staff writers for the Houston Chronicle, 8/12/10, “Our economy needs a robust space program”, http://www.chron.com/disp/story.mpl/editorial/outlook/7164226.html)

As the end of the space shuttle program nears, where and how America next travels into space appears unclear. There are no defined missions, destinations or deadlines. With the upcoming 50th anniversary of the first U.S. manned spaceflight — Alan Shepard's Mercury Freedom 7 suborbital flight on May 5, 1961, - America's leadership in space exploration is at risk of being set adrift into an uncertain future, cluttered with program cancellations, budget cuts and conflicting directives for government and commercial spaceflight development. In addition to the need to retain the unique technical expertise of tens of thousands of workers, the future of the space program is vital to the economic future of our nation. No other government program can match the economic impact of space program spin-offs that include applications in medicine, computer technology, communications, public safety, food, power generation and transportation. Where our economy goes in the future depends on where we go in space now. MRI testing, flat screen TVs, cordless power tools and solar power are examples of the long-term economic benefits of space technology spin-offs. A robust manned space program, with well defined missions, destinations and deadlines, is essential for NASA and U.S. advancement in science, technology, engineering and medicine. Such advancements inspire continued academic achievement and employment opportunities in these areas for America's youth. In the midst of the current political debate about NASA and America's future in space, it is easily overlooked that the dangerous endeavor of traveling into space requires purpose and focus on two principles that have been essential to successful U.S. manned space flight for nearly 50 years - proficiency and redundancy. Keeping the space shuttles flying will be essential to preserve the continuity of 30,000 jobs and maintaining American technical proficiency with regular space missions. The space shuttles also provide the United States with vital space transportation redundancy.

# Solvency Ext.

## Solvency Ext. 1/6

### THE ISS NEEDS THE SPACE SHUTTLE. A RETURN ON ISS INVESTMENT WOULD BENEFIT THE US.

Augustine, Norman (Chairman of the U.S. Human Spaceflight Plans Committee). 2009. ("SEEKING A HUMAN SPACEFLIGHT PROGRAM WORTHY OF A GREAT NATION." 2 Review of U.S. Human Spaceflight Plans Committee (2009): 10-11. Web. <legislative.nasa.gov/396093main\_HSF\_Cmte\_FinalReport.pdf>.)jk

The Committee is concerned that the ISS, and particularly its utilization, may be at risk after Shuttle retirement. The ISS was designed, assembled and operated with the capabilities of the Space Shuttle in mind. The present approach to its utilization is based on Shuttle-era experience. After Shuttle retirement, the ISS will rely on a combination of new international vehicles and as-yet-unproven U.S. commercial vehicles for cargo transport. Because the planned commercial resupply capability will be crucial to both ISS operations and utilization, it may be prudent to strengthen the incentives to the commercial providers to meet the schedule milestones. Now that the ISS is nearly completed and is staffed by a full crew of six, its future success will depend on how well it is used. Up to now, the focus has been on assembling the ISS, and this has come at the expense of exploiting its capabilities. Utilization should have first priority in the years ahead. The Committee finds that the return on investment from the ISS to both the United States and the international partners would be significantly enhanced by an extension of its life to 2020. It seems unwise to de-orbit the Station after 25 years of planning and assembly and only five years of operational life. A decision not to extend its operation would significantly impair the U.S. ability to develop and lead future international spaceflight partnerships. Further, the return on investment from the ISS would be significantly increased if it were funded at a level allowing it to achieve its full potential: as the nation’s newest National Laboratory, as an enhanced testbed for technologies and operational techniques that support exploration, and as a management framework that can support expanded international collaboration.

Solvency Ext. 2/6

### NASA space flights key to value to life – undermines artificial racial and ethnic divisions and realize place in universe

Newell ’11 (Terry, Founder of Leadership for a Responsible Society, “A Nation in Need of Awe”, http://www.huffingtonpost.com/terry-newell/nasa-space-program-ends\_b\_871271.html)

Of course, space exploration costs money in a debt-ridden government. Of course, manned space flight has had its share of tragedies (the loss of Apollo and two shuttle crews). Of course, there are more serious problems on earth to be solved. Of course, the end of the shuttle program is not the end of NASA. But the lack of attention to recent flights and the silence from Americans about their end are striking. The Mercury astronauts lifting into space, the lunar landings of Apollo, and the photos of deep space from the Hubble telescope have somehow receded into history, no longer the subject of the awe with which we first beheld them. It's not the loss of the shuttle but the loss of that awe that should cause us to reflect. The world is in need of awe. Beset by wars, debt, terrorism, climate change, religious fundamentalism, and poverty, humans are too focused on themselves and severely shell-shocked. Our lives need more of the miraculous. But the wonder that we need is not just the stuff of the conquest of space. It is the sense of our collective smallness in the universe, for some of our current troubles are also the products of our hubris. We thought, as the dominant species on the planet, that we could control far more than we should and can. Mother Nature and our complex societies are teaching us that we were wrong. In this sense, NASA's successes and tragic failures have reminded us not just of what we can accomplish but of how our accomplishments must be in harmony and not against forces greater than ourselves. NASA has lifted our hearts while at the same time anchoring us in humility. It has made us realize not only how amazing the universe is but that there is something more astounding than we are. People who have lost their capacity to experience awe are a threat to themselves, to others and to the planet we occupy. A single picture from NASA's past -- of the blue-green earth floating in space as seen from the moon -- helped us realize the delicate nature of our life in the vast coldness above and fostered the environmental movement. It also helped us see that boundaries of geography, nation, ethnicity, race and religion are distinctions we make that have no meaning in the cosmos. We need more such moments.

Solvency Ext. 3/6

### SHUTTLE GAURENTEES U.S. INVOLVMENT IN ISS – ABSENCE RISKS BACKLASH

Abbey, Geroge, and Neal Lane. 2009. ("United States Space Policy: Challenges and Opportunities Gone Astray." American Academy of Arts & Sciences (2009): 19. Web. www.amacad.org)jk

The ISS, involving close partnerships with Russia and thirteen other nations, has been a great accomplishment, the largest international cooperative technological project in history. In 2008, the European and Japanese research modules were installed on the station, and the partners are now in a position to gain a return on their substantial investment. But with the United States ending its support of the space shuttle program, its partners’ planned research is in jeopardy, and they will have no access to the new VSE program. Indeed, the decision to stop flying the space shuttle signaled that the United States no longer had much interest in the ISS, and that after 2010 other nations would be more or less on their own. NASA plans to buy trips to the space station on Russian Soyuz and Progress (cargo) spacecraft, but with relations between the United States and Russia at a low point, Congress has already questioned this arrangement.

### ONLY THE SPACE SHUTTLE CAN MAINTAIN THE ISS

Augustine, Norman (Chairman of the U.S. Human Spaceflight Plans Committee). 2009. ("SEEKING A HUMAN SPACEFLIGHT PROGRAM WORTHY OF A GREAT NATION." 2 Review of U.S. Human Spaceflight Plans Committee (2009): 52. Web. <legislative.nasa.gov/396093main\_HSF\_Cmte\_Final Report.pdf>.)jk

In considering the future of the ISS, the Committee examined issues related to the U.S. human spaceflight gap, cargo and crew resupply and the commercial launch industry, end of ISS life, ISS safety, and international relations. Several of the issues are intertwined, and several arise as a result of the impending retirement of the Space Shuttle. The Space Station was conceived, designed and built with the Shuttle in mind. Its operational strategy, utilization capacity, and philosophy of maintenance and spares were all Shuttle.

Solvency Ext. 4/6

### US shuttles key to ISS – key to foreign relats/liability

Kraft and Spencer ’11 (Christopher, Scott, 6/12/11, “Why we must save the space shuttle: If the Int'l Space Station is disabled, we need a rescue fleet”, http://articles.nydailynews.com/2011-06-12/news/29667814\_1\_international-space-station-russian-soyuz-space-crews)

For more than 10 years, space crews from the United States, Russia and other countries have successfully lived and worked year round, in six-month shifts, on the International Space Station, where they have conducted scientific research. In the coming years, that work will continue - but with a crucial safeguard missing: the space shuttle fleet that gives human beings a unique capability to fix the space station's guidance system and rocket thrusters in the event of a terrible failure. The shuttles are now about to retire - all of them, with no true replacements. This is an extremely dangerous development. Loss of control of the space station would mean a catastrophic reentry into the Earth's atmosphere of the massive structure - the largest object ever placed in orbit around the Earth, measuring over three football fields long and weighing more than 400 tons. The tons of falling debris that would survive reentry would pose an unprecedented threat to populated areas around the world. Such an international catastrophe would have significant ramifications for foreign relations and liability for the United States, Russia and the other countries who participate as partners on the space station. To be sure, the space station has numerous, triple-redundant life support and control systems that makes such a total technical failure unlikely. However, to say that it is so redundant that it could never happen ignores the tragic lessons learned due to the overconfidence in fail-safe technology in disasters throughout history, from the sinking of the Titanic to the nuclear reactor crisis in Japan. In fact, the numerous space station backup systems offer little margin of safety in the event of damage from a fire, space junk impact or a potential collision from the more frequent docking of manned and unmanned commercial spacecraft resupply missions. If the life support, guidance systems or rocket thrusters are damaged, the station could need a rapid rescue mission to stay in orbit. And as repair vehicles, the space shuttles have unique capabilities

Solvency Ext. 5/6

### Stopping the shuttle program nullify use of the ISS and give Russia a monopoly

Mike Snyder, aerospace engineer on the space shuttle program in Houston, 5/17/10, “Letter: This Is No Time to Retire Shuttle”, <http://www.spacenews.com/commentaries/100517-no-time-retire-shuttle.html>

In six months, the United States will retire the space shuttle, the most robust and capable space vehicle the world has ever seen, simply because our government has decided to do that. We have no vehicle to replace the space shuttle, and we will have no replacement for an unspecified amount of time. This is an enormous strategic mistake that requires serious reconsideration from all levels of government. Anything less will result in the U.S. surrendering its leadership role in human spaceflight for the foreseeable future. Unique, valuable skills, experience and knowledge will be lost as the work force has no other choice but to disperse. Ironically, the international space station, our $100 billion investment a quarter of a century in the making, is just nearing completion, and President Barack Obama is proposing to extend its mission until at least 2020. With the impending cancellation of the space shuttle program, there is little foresight and even less of a concrete plan on how we can fully utilize the space station to ensure it becomes everything that it can be and was promised to be. The fact is the space station was designed and always intended to be supported by the space shuttle in addition to unmanned cargo vehicles supplied by Russia, Europe and Japan. These cargo vehicles cannot completely replace the unique capabilities of the space shuttle and were always intended to act as a supplement. With the shuttle gone, the United States will be reliant on a foreign power, Russia, and its Soyuz spacecraft for an unspecified amount of time to transport astronauts to the space station, so heavily funded by the American people. For this service, Russia will be charging the United States approximately $50 million per seat. Per the space station agreement with our international partners, the United States transports European, Japanese and Canadian astronauts to the station on the space shuttle, since they have no crew capability of their own. Of course retirement of the shuttle does not nullify that agreement, and the American taxpayer will now also be paying Russia for the transport of our European, Japanese and Canadian partners as well. Compounding this problem is the fact Russia has signaled the price per seat will likely continue to increase as time goes forward. The United States will have no choice but to pay whatever Russia decides to charge, because, after all, we will have given Russia a monopoly and with that surrendered a part of our national sovereignty.

Solvency Ext. 6/6

### Shuttle program key to keep manned space alive

Lambright, W. Henry. 2010. professor of political science and public administration and director of the Center for Environmental Policy and Administration, “Exploring Space: NASA at 50 and Beyond.” Public Administration Review 70 (1) (January 1): 151-157. doi:10.1111/j.1540-6210.2009.02119.x.

The problem the agency has faced has been that some of the national decisions, such as the shuttle and space station programs, have been double-edged swords. They have kept human space exploration alive over the long haul, and certainly have been valuable in many ways. Without a shuttle, the Hubble Space Telescope would not have been repaired in 1993–94, and maintained subsequently. The space station is providing knowledge about how long-duration stays in space affect human beings, knowledge that is essential to future lunar and planetary manned expeditions. Having been built, it will be utilized for a range of purposes. But these programs have also created heavy inertial baggage that has mired the agency in low Earth orbit. The coalitions that are needed to get them started and continued at one point in an agency's history can be resistant to change at a later point. Important and worthy as major programs may be, they can last too long, cost too much, and divert the focus of the agency away from its prime mission of human space exploration. The problem the agency has faced has been that some of the national decisions, such as the shuttle and space station programs, have been double-edged swords. They have kept human space exploration alive over the long haul, and certainly have been valuable in many ways…. But these programs have also created heavy inertial baggage that has mired the agency in low Earth orbit. In the years since Apollo, NASA has demonstrated the awe of space exploration through the robotic program–planetary probes and space telescopes. The planetary probes have surveyed most of the major bodies of the solar system. Hubble has viewed the cosmos at incredible distances in space and back in time. There are some in the scientific community who would like to see NASA explore through machines alone. They have not prevailed because the public, media, and politicians relate mainly to bold human endeavors. The shuttle and space station programs kept manned space alive after Apollo ended. Space remote sensing has also raised awareness of the global warming issues of the home planet, a worthy achievement. But exploration by human beings–arguably NASA's distinctive competence–has been the mission waiting in the wings.2 Today, the human and robotic programs can converge around a common goal of exploring Mars. The country and world, with all their troubles, seem at last ready to advance to the future. What Republican George W. Bush initiated, Democrat Barack Obama may alter in trajectory, but hopefully will continue as to end. Other nations have indicated that they want to participate. The most important legacy of the International Space Station may be a model of long-term international collaboration. In spite of harsh times, there is forward momentum out of near Earth orbit. Events, political will, and administrative leadership will determine what happens next.

# 2AC Add-Ons

## Japan Relations Add-On 1/3

### ISS is crucial to collaborative space policy with allies such as Japan

Hauser and John, VP, Washington Operations, Research Analyst, 2009 (Marty and Mariel, “The International Space Station: Decision 2015,” http://www.spacefoundation.org/docs/ISS\_Decision\_2015.pdf. )

International partners place a great deal of importance in the ISS. The name of the Japan Aerospace Exploration Agency’s ( JAXA) laboratory Kibo means “hope” in Japanese. When the first module of the laboratory was delivered in March 2008, the Prime Minister of Japan hailed it as the beginning of Japan’s new “home in space.”20 Each international partner mentions its participation in the ISS program as a major effort of its space program. The JAXA vision statement, written in 2005, notes that participation in the ISS program shows Japan’s status as an “equal partner with the United States and European countries” and establishes its status in the international community.21 Russian, European, and Japanese space policy documents all mention the importance of research done on the ISS to successful future human spaceflight missions.22 If U.S. support for the ISS program lapses in 2015, it is likely that one of the most significant negative impacts would be on international relations, and global perceptions as to whether or not the U.S. is a reliable partner. Concern over U.S. intentions is already apparent. Even amid the excitement of the Kibomodule being launched, an article was published in the Daily Yomiuri, an English-language online supplement to Japan’s largest selling newspaper, that warned people not to be overly optimistic.23 The article notes that the United States plans to shut down the ISS in 2015 and, if that happens, the Kibo laboratory will not be operational for the 10 years it was designed to last, in which case benefits from the project may be limited. The article highlights the risks of “international projects in cooperation with countries like the United States, where policies can change abruptly with the changing of administrations.” The article also says that Europe has engaged in diplomatic talks with Russia and the United States about the ISS, while Japan, “has relied almost completely on the United States, and has fallen behind Europe as a result.”24 At the 2009 Paris Air Show, international partners voiced their interest in continuing the ISS mission past 2015, possibly to 2025. European Space Agency partners noted that they have a strong desire to extend the program to fully exploit their Columbus science lab.25 The ramifications of a decision to withdraw from the ISS program in 2015 would, therefore, extend far beyond this single project. The United States’ choice to honor (or not) international commitments vis-à-vis the ISS will affect other countries’ views of the United States as a partner in virtually all future endeavors. The ISS provides the opportunity to cement lasting partnerships and cooperation in many areas. A unilateral U.S. decision to end the program against the wishes of the international partners will adversely affect future programs. If the United States is unable to sustain its engagement with its international partners, it will either have to forgo future large-scale space programs, or undertake all costs on its own.

Japan Relations Add-On 2/3

### US-Japan space collaboration stops Chinese and Korean wars saving millions

Campbell et al., senior vice president and director of the International Security Program at CSIS , 2003 (Kurt M., “U.S.-Japan Space Policy: A Framework for 21st Century Cooperation,” http://csis.org/files/media/csis/pubs/taskforcereport.pdf.)

The most important factor affecting the context for U.S.–Japan space policy is the evolution in the regional security environment over the past decade, particularly in the last 2–3 years. Two key sources of instability have heightened concern about security in the region: China’s military build-up and confrontational stance toward Taiwan, and North Korea’s efforts to develop or acquire weapons of mass destruction and ballistic missile capabilities. Because of these two developments, the United States has refocused its attention on East Asian security, even at a time when the primary focus of American security policy is the Middle East. At the same time, these developments have led Japan to develop a new awareness of the threats to its security and the need to play a more active role in ensuring regional security, and also a fresh appreciation of the need for U.S. involvement in the region, in the roles of power balancer and security guarantor. China’s ongoing military build-up is a cause for concern in both the United States and Japan. Both countries have strong economic and growing political ties with China, but both are wary of China’s long-term ambitions in the region, and its potential behavior if it assumed hegemonic status in the region. This shared concern is a long-term driver of U.S.–Japan security cooperation: the United States needs Japan to maintain a forward presence in the region, and this military engagement denies hegemonic status to China. This power balance extends to space policy. China has a network of eighteen reconnaissance satellites that allow it to spy on its neighbors from above and monitor military activities in the region. Even after Japan reconnaissance satellite system is fully deployed, it will still rely upon the United States to balance China’s space-based capabilities. Space-based technology would play an important role in any plausible scenario for a war across the Taiwan Strait—early detection of Chinese missile launches could protect Taiwan’s large cities from devastating casualties. The threat to Japan itself is much more unlikely and remote, but long-term historical grudges keep the Sino–Japanese relationship in a lukewarm state, cordial at best.xiv North Korea’s stated nuclear ambitions and proven ballistic missile capabilities pose a real threat to the territory of both the United States and Japan. By many standards, this is the most dangerous threat in the world today. Of greater concern at present is the situation on the Korean Peninsula. North Korea’s conventional military capabilities could devastate South Korea and inflict massive civilian casualties if a conflict were to break out. This tense situation has heightened the sense of danger in the region to a level not witnessed since the end of the Korean War, and brought security issues to the forefront of the U.S.–Japan bilateral relationship.xv Japan and the United States are not without their differences on the right response to the North Korean threat, but the two countries have strengthened their cooperation on this issue of mutual concern. The North Korea threat has strong implications for space policy. Even after the launch of its own reconnaissance satellites, Japan remains reliant on the United States for launch detection and high-grade space imaging. The two countries are cooperating on research for a theater-wide ballistic missile defense system, which would utilize sea-based and spacebased assets to detect and destroy any missile launched from North Korea toward Japan or the United States. This mutual dependency has led to an overall improvement in the U.S.–Japan security relationship and reinforces the need to find a new framework for space policy cooperation that is based more strongly on security concerns.

Japan Relations Add-On 3/3

### Unified space policy solves US-Japan relations which are key to economy and regional security

Campbell et al., senior vice president and director of the International Security Program at CSIS, where he also holds the Henry A. Kissinger Chair in National Security, 2003 (Kurt M., “U.S.-Japan Space Policy: A Framework for 21st Century Cooperation,” http://csis.org/files/media/csis/pubs/taskforcereport.pdf.)

This is a crowded plate, but space policy belongs as a key part of this agenda, because it complements and reinforces the key priorities of the relationship. The right bilateral space policy will lead to improved regional and international security, and have positive spillover effects on the two countries’ economies. Strong ties in space policy can serve as a pillar of strength at times in the future when the relationship is under stress. The strong relationship between the United States and Japan has proven its worth since the terrorist attacks of September 11th, and remains a bulwark of stability in the Asia–Pacific region. But the existence of good relations should not be cause for inaction in either country. Instead the two countries should use this period of time for renewal and extension in policy areas of growing importance. Space policy is one of these areas, and this report lays out a roadmap for U.S.–Japanese cooperation in the next decade.

### And, a strong U.S.-Japan Alliance is key to solve regional stability, sea commerce, proliferation, terrorism, and drug trafficking.

Rapp, Council on Foreign Relations- Hitachi International Affairs Fellow at the Institute for International Policy Studies in Tokyo, in ‘4

[William, , PATHS DIVERGING? THE NEXT DECADE IN THE U.S.-JAPAN SECURITY ALLIANCE, January 2004, https://www.strategicstudiesinstitute.army.mil/ pdffiles/PUB367.pdf]

Because neither country has a viable alternative to the alliance for the promotion of security and national interests in the region, especially given the uncertainties of the future trends in China and the Korean Peninsula, for the next couple of decades the alliance will remain central to achieving the interests of both Japan and the United States. A more symmetrical alliance can be a positive force for regional stability and prosperity in areas of engagement of China, proactive shaping of the security environment, the protection of maritime commerce routes, and the countering of weapons proliferation, terrorism, and drug trafficking. Without substantive change, though, the centrality of the alliance will diminish as strategic alternatives develop for either the United States or Japan.

## Cooperation Add-On

### The ISS promotes global partnership

NASA ’11 (National Aeronautics and Space Administration, 5/9/11, “International Cooperation”, http://www.nasa.gov/mission\_pages/station/cooperation/index.html)

The International Space Station (ISS) Program’s greatest accomplishment is as much a human achievement as it is a technological one—how best to plan, coordinate, and monitor the varied activities of the Program’s many organizations. An international partnership of space agencies provides and operates the elements of the ISS. The principals are the space agencies of the United States, Russia, Europe, Japan, and Canada. The ISS has been the most politically complex space exploration program ever undertaken. The International Space Station Program brings together international flight crews, multiple launch vehicles, globally distributed launch, operations, training, engineering, and development facilities; communications networks, and the international scientific research community. Elements launched from different countries and continents are not mated together until they reach orbit, and some elements that have been launched later in the assembly sequence were not yet built when the first elements were placed in orbit. Operating the space station is even more complicated than other space flight endeavors because it is an international program. Each partner has the primary responsibility to manage and run the hardware it provides. Construction, assembly and operation of the International Space Station requires the support of facilities on the Earth managed by all of the international partner agencies and countries involved in the program. These include construction facilities, launch support and processing facilities, mission operations support facilities, research and technology development facilities and communications facilities.

### ISS key to international relations

Louis Jacobson ’10 (Staff writer for politifact, 2/15/10 , “Obama budget would extend life of International Space Station”, http://www.politifact.com/truth-o-meter/promises/obameter/promise/335/work-with-international-allies-on-space-station/)
Continuing to use the ISS over the longer term is not a foregone conclusion, since its expected retirement date is officially January 2016. But in seeking to continue utilizing the station until at least 2020, Obama followed the recommendation of the U.S. Human Space Flight Plans Committee, a blue-ribbon panel more commonly known as the Augustine Committee, after its chairman, Norman Augustine, the former CEO of Lockheed Martin. That committee advised that "the return on investment of (the International Space Station) to both the United States and the international partners would be significantly enhanced by an extension of ISS life to 2020," according to a summary released last September. "It seems unwise to de-orbit the station after 25 years of assembly and only five years of operational life. Not to extend its operation would significantly impair U.S. ability to develop and lead future international space flight partnerships. Further, the ISS should be funded to enable it to achieve its full potential: as the nation's newest national laboratory, as an enhanced test bed for technologies and operational techniques that support exploration, and as a framework that can support expanded international collaboration." The summary continued, "The strong and tested working relationship among international partners is perhaps the most important outcome of the ISS program. The partnership expresses a 'first-among-equals' U.S. leadership style adapted to today's multi-polar world."

Cooperation Add-On

### International collaboration solves space security

Blount, National Center for Remote Sensing, Air, and Space Law, University of Mississippi School of Law, 2010 (P.J., “International Cooperation: The Key to Space Security,” National Institute of Space Law, http://papers.ssrn.com/sol3/papers.cfm?abstract\_id=1781063.)

Today’s space environment faces different security challenges than those being contemplated during the negotiation of the principle space treaties. Instead of two symmetric world powers both vying for supremacy in space, as during the Cold War, the space environment is now populated by a variety of actors on disparate footing with one another. Additionally, the goals and motivations of these actors also vary dramatically. Thus the same issues that once led to security threatening destabilization in space are no longer relevant. In today’s geopolitical climate space is populated by a number of relatively new actors. Some of these could be identified as possible spoilers in that there is potential for them to exploit the weaknesses of the space environment in order to gain strategic advantage over an adversary. Others are simply interested in harnessing of space’s unique capabilities to enhance the life of their citizens. And still others are participating in the same sort of technological race that the Soviets and Americans engaged in during the space race. Numerous commentators have endorsed renegotiating the treaty regime in order to deal with the changing technological landscape as well as the changing geopolitical regime. Such renegotiation could have deleterious effects on the space environment. While the treaty regime is far from perfect, particularly in the realm of security matters, it does contain basic core principles that are crucial to maintaining a secure space environment. Changing technological and geopolitical situations give the international community the unique opportunity to re-engage with these principles in order to continue to maintain space as a realm for peaceful activity. However, this re-engagement requires States to act in good faith towards such ends. The principle of international cooperation is chief among those set out in the early days of space law that seeks to normalize relations among States in space. As already stated this principle is often seen in data-sharing provisions. This was crucial during the time of negotiations because of the propensity for outer space activities to resemble activities related to the launching of intercontinental ballistic missiles (ICBMs). While much of that particular fear has dissolved, information sharing is still vital in order to maintain space security. An example of this is the space debris problem, which can fairly be characterized as one of the single largest security issues in space. Space debris has in recent years been caused not just by States being careless in what they put into space, but by major debris creating events, which have dramatically increased the amount of debris in space. These events might have been avoided or mitigated if there was a better data sharing regime in place. Transparency in space activities can lead to trust among those utilizing outer space. This is not to say that international cooperation is a heal all for security problems in space. Some States will likely still exploit the space environment to their own ends. For instance North Korea will likely still try to use its space program as camouflage for clandestine missile development. The fact is that the world is a complicated place, and security concerns for States come from issues outside space. Space security is only a component of any State’s overall security concerns. The potential for spoilers exists in any security arena, and no single<Continued>

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 <Continued> international instrument can hope to eradicate all threats from all outliers. The space regime though, with international cooperation as its heart and soul can help to mitigate such threats and may be the best system available for this purpose. The sharing of data can help States identify when a real threat exists, so as to avoid false alarms and heightened security situations. Furthermore, international cooperation in the form of technical assistance can help States extend their influence to possible outliers and engage them in such a manner that they can be prevented from becoming a security threat in space. III. International Cooperation at the National Level The idea of international cooperation is becoming more and more popular as a central part of national space policies. This can be seen in both the recent Japanese space policy as well as the most recent American space policy. The Japanese space policy, Basic Plan for Space Policy: Wisdom of Japan Moves Space, was released in 2009. It contains six pillars that Japan will build its space program around; the third pillar is titled “Promotion of Space Diplomacy.” This pillar embraces the idea of international cooperation. Japan’s policy identifies several areas that Japan’s technology can be applied in specific efforts at international cooperation. It also specifically states that “even though the international rules for space have been established at international fora . . . there are new challenges such as measures to space debris . . . and future challenges of ascription of natural resources of the moon and space traffic management.” The policy acknowledges that in order to solve such problems it is crucial that Japan “proactively participate in formulating international rules for space.” Japan is clearly acknowledging its duty under international law to engage with other States on cooperation issues, specifically on security related issues. The new America Space Policy, which was released earlier this year, also highlights international cooperation as one of its core values. The first principle set out in the policy is: It is the shared interest of all nations to act responsibly in space to help prevent mishaps, misperceptions, and mistrust. The United States considers the sustainability, stability, and free access to, and use of, space vital to its national interests. Space operations should be conducted in ways that emphasize openness and transparency to improve public awareness of the activities of government, and enable others to share in the benefits provided by the use of space. This acknowledges the international character of space and encourages transparency as a value. The policy then follows up by setting as one of its goals : Expand international cooperation on mutually beneficial space activities to: broaden and extend the benefits of space; further the peaceful use of space; and enhance collection and partnership in sharing of space-derived information. Additionally, the policy includes an entire section on international cooperation. Very much like the Japanese policy it sets forth an affirmative duty to engage in creating new international instruments to help secure space. IV. Balancing National Security A secure space environment does not always mean that a State is doing what it needs to do to ensure its own national security. In fact neither of the two space policies examined abandon using space to secure their national interests. The United States policy even goes so far as to include Collective security in its international cooperation section. The legal obligation of international cooperation does not require a State to place national security issues above space security issues. This is one of the main reasons for soft language used in the treaty formulations of the principle. It does, though, require a good faith effort to engage, or in terms of the Outer Space Treaty’s <Continued>

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<Continued>Article IX to use “due regard” when dealing with other States. A balance between national security and space security must always be maintained by States engaging in space activities. However, national security can be enhanced by international cooperation. For instance, the Hague Code of Conduct is a perfect example of this of net increase in security. It requests that subscribing States exchange data on space and ballistic missile launches. Via this mechanism States are to engage in a transparent discourse on technologies leading to greater security for all States involved. IV. Conclusion International Cooperation is a crucial part of the space law regime meant to help secure outer space and avoid destabilizing situations. It is important that it be used as the current geopolitical make-up of space actors continues to change. It requires States to work toward mechanisms that allow them to communicate with each other in order to mitigate risk in the space arena. As more States begin to use space it is important that transparency and cooperation be the keystones in space security law. Through these mechanisms space security can be enhanced and the continued use of outer space for peaceful purposes can be realized.

Cooperation Add-On

### Mulilateral action is key, especially in space

Logdson, Director of the Space Policy Institute of George Washington University’s Elliott School of International Affairs in Washington, DC, 2003. (John M., “Reflections on Space as a Vital National Interest,” Astropolitics, http://www2.gwu.edu/~spi/assets/docs/space\_as\_a\_national\_interest.pdf.)

Given how highly interdependent the world has become, the U.S. really has no feasible alternative to multilateralism. Furthermore, this approach is the best strategy for policymakers as it has the highest probability for long-term success. Wayne S. Smith, senior fellow at the Center for International Policy in Washington, D.C., concludes, “In an age of instant communications, multinational and global flows of capital, the idea that even the powerful United States can decide itself is illusory.” It is in the national self- interest for the U.S. to build international bridges in the arena of space operations. The factors that will drive multinational cooperation- -cost, limited direct influence over international players through military or economic action, international treaties and organizations, the proliferation of multinational companies and an overall desire by the U.S. to be perceived as a team player—rely on international cooperation and global interdependence. Before delving deeper into why America should follow multilateralism, it is best to look closely at the reasons it will not follow the other three models. The technological example set forward by the British Royal Navy during the latter half of the nineteenth century presents an interesting example for U.S. policymakers, but scientific knowledge is difficult to contain. At the close of World War II, the U.S. was the only nuclear capable nation. Despite the tight security placed upon America’s nuclear secrets, fifty- five years later nations from Iraq to North Korea, India and Pakistan have the ability to develop and deploy nuclear weapons. In 1960, only two nations were members of the elite space- faring club; today, that number has risen to at least seven, plus the ESA, and could well double within the next generation, as technology proliferates across the globe. Furthermore, if technological development is an issue, any group willing to expend the funds can purchase a satellite on orbit from numerous commercial or governmental agencies. If funding is an issue, any number of services can be shared or directly purchased in such areas as communication or surveillance. As we have seen, commercial companies, such as SPOT, provide high-resolution imagery for public consumption at a nominal cost. Technological edges cannot be safeguarded or guaranteed in perpetuity, particularly in a global environment. Once the bottle is opened, it is impossible to get the genie back inside. A second alternative policy, unilateralism, does preserve freedom of action in the short term; the question, however, is whether U.S. policy should be based upon short-term gain over longterm benefits; whether independence trumps cooperative action which fosters adherence to the 50 rule of law and strengthens international organizations. Unilateral action often reinforces the view of an American “cowboy” approach to foreign policy, generating resentment that makes it more difficult for the U.S. to deal cooperatively with the international community on other issues of common interest (e.g., U.S./European relations concerning Iraqi disarmament ). This growing anti-American sentiment is represented by mass demonstrations in Europe and the <Continued>

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<Continued> Middle East in February 2003 against potential American military action against Iraq, and numerous public demonstrations in South Korea protesting the decades-old American military presence. While a multilateral approach takes more time to implement, it provides benefits across the international spectrum, including trade, investment, intelligence sharing, and space operations. It does this by building an atmosphere of trust and a greater willingness to engage in dialogue and to cooperate on maters of mutual national interest. Stephen Miller, director of the International Security Program at Harvard’s Kennedy School of Government, states that U.S. policy must change dramatically to accommodate the exigencies of the war against terrorism. He prescribes to the belief that the world did in fact change following the attack on 11 September 2001; above all else, he claims that September 11 and its aftermath must spell the end of U.S. unilateralism. He notes that while strong intelligence ties exist with allies and close friends, the U.S. may wish to point those collaborative efforts more directly at the growing terrorist threat and to use existing networks in different ways. Miller proposes that the best hope U.S. policymakers have to influence the international community is to draw the major states into networks of cooperation and consultation. Compromise need not be seen as a sign of weakness, but rather as a means of moving toward an objective with the cooperation of others, thus at a lower cost to the United States. The third alternative policy, the American Empire theory, emphasizes the global nature of American influence and its tendency to use military might to obtain national interests. Joseph Nye, dean of the Kennedy School of Government, addressed this issue by saying, “I think people who talk about ‘benign hegemony’ and ‘accepting an imperial role’ are focusing too much on one dimension of power and are neglecting the other forms of power- -economic and cultural and ideological.” Along the same lines, Richard Kohn, a University of North Carolina historian, argues that most Americans would wisely reject an imperial role if it were put to them openly. “The American people don’t have the interest, the stomach or the perseverance to do it.” Stephen Miller adds, “The unrivaled military superpower cannot, by arms alone, protect itself from the violence and fanaticism of the weak and the dispossessed.” Current military force levels make it problematic for U.S. global control; furthermore, short of invasion and occupation, how could America use its military might to control international space efforts? Leading with the military as a policy approach has significant technological limitations as well. Despite being the sole remaining superpower, any long-term action without multilateral support is extremely difficult. The U.S. Army requires land-basing rights, as it had with Saudi Arabia during Operation DESERT STORM; the Air Force, while possessing significant air refueling capability, desires land bases within the theater of operation for rapid mission turnaround and the ability to produce multiple sorties; and while the Navy with its carrier task forces is the most self-sufficient service, when engaged in offensive operations, naval aircraft fall prey to the same restrictions found with Air Force fighter aircraft (i.e., short range and limited payload). Consequently, U.S. policymakers have few other real alternatives to multilateralism. America cannot expect to protect its technological edge in perpetuity, unilateral action does not garner international legitimacy or foster long-term international cooperation, and, despite being the sole remaining superpower, the U.S. military has severe restrictions that demand multinational collaboration. Thus, American policymakers need to design a strategy to protect vital U.S. space interests based upon a multilateral approach. The next question is, Will they?

Cooperation Add-On

### International collaboration is key to further ISS operations

Logsdon, Director, Graduate Program in Science, Technology and Public Policy, George Washington University, Washington, DC, North American editor of Space Policy, 1991 (John M., International involvement in the US space station programme, Space Policy 7, http://www.sciencedirect.com/science/article/pii/026596469190044I.)

Countries engage in international cooperation in scientific and technical undertakings for a variety of reasons. In order to assess the potential advantages and disadvantages of international participation in a US space station programme, it is first necessary to understand the reasons which lead nations to engage in international technical cooperation in general. These motivations can then be discussed as they apply to the specific situation of space station development and operation. There are both symbolic and utilitarian objectives which lead a country to involve others in its technical activities through formal cooperative agreements. Among the national objectives served by such involvement are: (1) Symbolic objectives: (a) Political and policy influence - a country may engage in international cooperation to influence political attitudes and policy outcomes in cooperating countries, in particular so that those attitudes and outcomes are compatible with its own national objectives. (b) Policy legitimization - a country may invite others to cooperate with it to enlist their support for a particular course of action that the country intends to pursue; also, broadening the base of involvement in an undertaking may increase its legitimacy both at home and abroad. (c) Policy commitment - a country may allow others to participate in one of its undertakings as a means of gaining their support for other of that country's policies. (d) Leadership - a country may invite others to join it in a common undertaking because it believes that such an intimate partnership will allow it to demonstrate clearly to others its leadership position. (e) Cooperation to encourage cooperation - a country may initiate or enter into a specific cooperative undertaking to demonstrate commitment to the general principle of international cooperation as a desirable course of action. (2) Utilitarian objectives: (a) Division of labour and sharing of costs - a country may invite others to join in an undertaking to achieve a necessary or desirable sharing of the burdens, particularly the cost, of that undertaking. (b) Access to foreign resources - a country may open one of its undertakings to foreign participation to engage or have access to unique or superior resources, both physical and human, available only in other countries. (c) Economic influence - a country may invite others to participate in an undertaking to increase the likelihood that they will then purchase the products or services of that undertaking, rather than of potential competitors. The USA has made international cooperation in science and technology, in space as in numerous other sectors, a major element of its foreign policy; most observers agree that the overall benefits of such cooperation in both symbolic and utilitarian terms have been substantial, and that the negative impacts have been comparatively insignificant. Unless it begins a technical undertaking for motivations which are overwhelmingly nationalistic and/or dominantly economic in character (such as Project Apollo or the development of communication satellites), the US government has welcomed the participation of its closest allies in its R&D efforts.

Cooperation Add-On

### International cooperation is necessary for heg.

Robert Tucker, professor emeritus of American foreign policy at Johns Hopkins University, Commentary, January 2000, p. 46

During the long period of the cold war, the justification of American power was the defense of the independence of states from the threat posed by a hostile and expansionist Soviet Union. The policy of containment responded by and large to the time‑honored compulsions of the balance of power. The order defended by American power was inseparable from containment. It is the case that the identification of threats to this order provoked periodic disputes with allies. Unilateral action taken by the principal guarantor of containment did not go without criticisms, at times even harsh criticism. On balance, though, disaffection was limited by the visible threat of Soviet power. The understandings of this earlier period no longer hold. Although the United States remains the principal guarantor of the post‑cold‑war order, this order, save for its economic dimension, no longer has the compelling character that the Soviet threat gave to the cold‑war order. Our difficulties in obtaining support for more effective sanctions against Iraq testify to this. Unless we are very lucky, a sustainable foreign policy in the years ahead will require either increasing the means of policy or invoking the greater cooperation of others. And since there is little reason for believing that the means of policy will be increased, we are left to rely on the greater cooperation of others. But the greater cooperation of others will mean that our freedom of action is narrowed. This would already appear to be the price in Europe of greater mutuality, as the Balkan wars have shown. In turn, European cooperation has been a necessary condition of American domestic support. Unilateralism would forfeit this cooperation.

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## Disease 1/3

### ISS-unique microgravity research will allow for the development of vaccines that combat diseases such as salmonella and save countless lives

NASA, National Aeronautics and Space Adminstration, 1/13/10 (“Vaccine Development,” <http://www.nasa.gov/mission_pages/station/research/nlpv2.html>.)

What was done on ISS The space environment has been shown to induce key changes in microbial cells that are directly relevant to infectious disease, including alterations of microbial growth rates, antibiotic resistance, microbial invasion of host tissue, organism virulence (the relative ability of a microbe to cause disease), and genetic changes within the microbe (Wilson et al., 2007, 2008). The targets identified from each of these microgravity-induced alterations represent an opportunity to develop new and improved therapeutics, including vaccines, as well as biological and pharmaceutical agents aimed specifically at eradicating the pathogen. Research on Salmonella bacteria, led by Dr. Timothy Hammond at the Durham Veterans Affairs Medical Center and Dr. Cheryl Nickerson at Arizona State University, has been conducted from 2006 to 2008 on space shuttle missions flown to the International Space Station. Collectively, this body of work has shown that the virulence of this organism increases in microgravity. Experiments conducted on the space shuttle in March and May 2009, have examined the virulence of methicillin-resistant Staphylococcus aureus (MRSA) as well as other microbes. The studies of Salmonella and MRSA bacteria in space are part of the pathfinder program to demonstrate the use of the International Space Station as a research platform for commercial research and development. The pathfinder research approach uses a set of flight experiments to identify the components of the organisms that facilitate increased virulence in space, and then applies that information to pinpoint targets for anti-microbial therapeutics, including vaccines. Significance: Discovering the factors responsible for growth and virulence of bacteria will contribute to the development of novel therapeutic treatments, including vaccines. In fact, Astrogenetix's space-based Salmonella research has resulted in the discovery of a potential candidate vaccine for this pathogen. Salmonella infection is one of the most common forms of food poisoning in the US. Worldwide, Salmonella diarrhea remains one of the top three causes of infant mortality, so a vaccine has the potential to make dramatic improvements in health for developing countries. Studies on bacterial virulence have also been extended to MRSA. Benefits of ISS Research: This space-based research provides evidence that the International Space Station as a National Laboratory is a valuable resource that can be utilized for the benefit of Earth. Discovery of therapeutic targets for MRSA and Salmonella infections are examples of efforts to use the novel microgravity environment to develop new pharmaceutical agents, and as ISS nears its completion, there will be an increase in such opportunities to utilize the ISS National Laboratory as a platform for drug discovery. Overall, these results represent just a fraction of the possibilities of future microgravity discoveries.

Disease 2/3

### ISS CURRENTALY ON ROAD FOR DEVELOPING CURE FOR CANCER

Le Piver, Patrick, et al. 2011. "Cancer Treatment Delivery." NASA. NASA, 2/25/11. Web. <http://www.nasa.gov/mission\_pages/station/research/pfms.html>.

What was done on ISS: A single step process forming tiny liquid-filled, biodegradable micro-balloons containing various drug solutions (a process called microgravity micro-encapsulation) can provide better drug delivery and new medical treatments for solid tumors and resistant infections. Testing in mouse models has shown that these unique microcapsules can be injected into human prostate tumors to inhibit tumor growth or can be injected following cryo-surgery (freezing) to improve the destruction of the tumors much better than freezing or local chemotherapy alone. The microcapsules also contain a contrast agent that enables C-T, x-ray or ultrasound imaging to monitor the distribution within the tissues to insure that the entire tumor is treated when the microcapsules release their drug contents.
The Microencapsulation Electrostatic Processing System-II experiment (MEPS-II), led by Dr. Dennis Morrison (retired) at NASA Johnson Space Center, was performed on ISS in 2002 and included innovative encapsulation of several different anti-cancer drugs, magnetic triggering particles, and encapsulation of genetically engineered DNA. The experiment system improved on existing microencapsulation technology by using microgravity to modify the fluid mechanics, interfacial behavior, and biological processing methods as compared to the way the microcapsules would be formed in gravity. In effect, the MEPS-II system on ISS combined two immiscible liquids in such a way that surface tension forces (rather than fluid shear) dominated at the interface of the fluids. The significant performance of the space-produced microcapsules as a cancer treatment delivery system (Le Pivert et al. 2004) motivated the development of the Pulse Flow Microencapsulation System (PFMS), which is an Earth-based system that can replicate the quality of the microcapsules created in space. Significance: As a result of this ISS research, the results from the MEPS-II experiments have provided new insight into the best formulations and conditions required to produce microcapsules of different drugs, particularly special capsules containing diagnostic imaging materials and triggered release particles. Co-encapsulation of multiple drugs and Photodynamic Therapy (PDT) drugs has enabled new engineering strategies for production of microcapsules on Earth designed for direct delivery into cancer tissues. Other microcapsules have now been made for treatment of deep tissue infections, clotting disorders, and to provide delivery of genetic engineered materials for potential gene therapy strategies (Morrison et al. 2003). Microcapsules that were made on ISS and that are targeted at inhibiting growth of human prostate tumors have been successfully demonstrated in laboratory settings (Le Pivert et al. 2004, LePivert et al 2009).

Disease 3/3

### Cancer causes millions of deaths annually and will only grow more lethal

World Health Organization, directing and coordinating authority for health within the United Nations system, responsible for providing leadership on global health matters, shaping the health research agenda, setting norms and standards, articulating evidence-based policy options, providing technical support to countries and monitoring and assessing health trends, 4/3/03 (“Global cancer rates could increase by 50% to 15 million by 2020,” http://www.who.int/mediacentre/news/releases/2003/pr27/en/.)

GENEVA, 3 APRIL 2003 - Cancer rates could further increase by 50% to 15 million new cases in the year 2020, according to the World Cancer Report, the most comprehensive global examination of the disease to date. However, the report also provides clear evidence that healthy lifestyles and public health action by governments and health practitioners could stem this trend, and prevent as many as one third of cancers worldwide. In the year 2000, malignant tumours were responsible for 12 per cent of the nearly 56 million deaths worldwide from all causes. In many countries, more than a quarter of deaths are attributable to cancer. In 2000, 5.3 million men and 4.7 million women developed a malignant tumour and altogether 6.2 million died from the disease. The report also reveals that cancer has emerged as a major public health problem in developing countries, matching its effect in industrialized nations. “The World Cancer Report tells us that cancer rates are set to increase at an alarming rate globally. We can make a difference by taking action today. We have the opportunity to stem this increase. This report calls on Governments, health practitioners and the general public to take urgent action. Action now can prevent one third of cancers, cure another third, and provide good, palliative care to the remaining third who need it, "said Dr. Paul Kleihues, Director of the International Agency for Research on Cancer (IARC) and co-editor of the World Cancer Report.

### New experiments solve disease risks to space exploration.

Space Daily, 4/5/2010, “New Study Investigates Infection Of Human Cells In Space,” http://www.spacedaily.com/reports/New\_Study\_Investigates\_Infection\_Of\_Human\_Cells\_In\_Space\_999.html

In a first-of-its-kind experiment, the unique conditions of spaceflight will be used to examine how cells remain healthy or succumb to disease, particularly in the face of stress or damage. At 3:21 a.m. PDT on April 5, ASU Biodesign Institute researchers Cheryl Nickerson and her team, including Jennifer Barrila and Shameema Sarker, will see their latest experiment launched into low earth orbit aboard the space shuttle Discovery on mission STS-131.The goals of the team's research are to provide fundamental new insight into the infectious disease process, and further undestanding of other progressive diseases, including immune disorders and cancer. The knowledge gained from this work may eventually aid in the development of new treatments for infectious diseases, which remain a leading cause of human morbidity and mortality worldwide. Results of the current study will also be used to help mitigate infectious disease risks to the crew, who are particularly vulnerable to infection, due to reduced immune function during spaceflight missions.

# AT: Neg Args

## A2: Russia

### Russia plans to raise cost of shuttle seats dramatically for US

Alan W. Dowd 8/3/9, award-winning writer of U.S. foreign policy, national defense and international security for The American Legion Magazine, “Surrendering Outer Space”, <https://www.hoover.org/publications/policy-review/article/5421>

Beijing is building up its space assets and arsenal, and the United States will begin, in 2010, to rely on Russia to carry Americans into space. “That is a terrible place for the United States to be,” Griffin conceded last year. As he added in remarks to the House Committee on Science and Technology, “I deplore the posture in which we find ourselves. It is unseemly in the extreme.” In the most basic terms, nasa will purchase seats and room on Russian rockets for American astronauts and equipment, just like you and I purchase airline tickets. To extend the metaphor, the United States will be at the mercy of the airline — Russia, in this case — as to when its personnel depart, how long they stay, what they can take with them, and so on. This is very troublesome, especially given Russia’s open hostility to U.S. interests and policies of late. Just imagine the U.S. needing to repair a military or telecommunications satellite on short notice or without the interference of prying eyes. And then imagine the mischief Moscow could make in such a situation. Equally worrisome is the high-stakes bargaining — or, if you prefer, blackmail — this unfortunate situation invites. What’s to stop the Kremlin from demanding that, in exchange for a trip into space, the U.S. deactivate missile defense bases in Poland or the Czech Republic, pull out of Kosovo, look the other way as the Russian army finishes what it started in Georgia, or accede to Russian control over some new energy pipeline? These aren’t fanciful notions. They are real issues that Russia takes very seriously.

### Dependence on Russians increases cost of space travel, strips US control over flights, leads to loss of heg

Bruce Tyson, 4/20/10, writer for helium, “The problem with NASA relying on Russia's Soyuz capsule for travel to the International Space Station”, <http://www.helium.com/items/1809638-the-problem-with-nasa-relying-on-russias-soyuz-capsule-for-travel-to-the-international-space-station>

The first problem with the proposal to hire the Russians for America’s space transportation needs is the cost. At an estimated cost of $56 million per astronaut, some people point out those costs can escalate over time. NASA reports that the average space shuttle mission costs $450 million, but that cost includes a large payload capacity. Control Without its own space transportation, the United States has no control over when missions can go to the ISS. Furthermore, since other nations also rely on Russia for transport, American missions could easily get bumped in the event a higher bidder wins priority. Americans no longer would have control over mission quality, meaning that American lives could be jeopardized by mechanical or human failure within the Russian program. Also, since Russian relations with the U.S. are historically turbulent, any new crisis could result in the loss of American interests in space. The United States could become subject to space blackmail, being forced to make additional financial or policy concessions in order to avoid the spectacle of Americans being stranded in space. Dependence With the demand for space travel being outsourced to Russia, the United States will feel less pressure to deploy a new manned space vehicle. With NASA’s latest program, the Constellation, cancelled, an indefinite window now exists where America will have to depend on the Russians. The Soyuz program will not remain viable forever, so sooner or later a rmajor space crisis could develop. Pride The United States has been the leader in space travel and technology for decades. By lacking the will to take care of its own needs, the nation now has to depend on a potential adversary for space travel. Some people feel that the loss of American capacity to put human beings into orbit is symbolic of a larger decline. A loss of American exceptionalism in full view of the entire world portrays elements of weakness that is uncomfortable to many Americans. As the nation continues to appear weak, it stands to continue to lose power and influence on the international stage.

A2: Russia

### Current plan with Russia saves no money and delays U.S. access to space

Glenn 10 (John Glenn, Senator from Ohio, former astronaut and pilot. 6-21-10, “Keep the Space Shuttles Flying.” <http://www.universetoday.com/66983/john-glenn-keep-the-space-shuttles-flying/>)

“The world’s only heavy-lift spacecraft and the U.S.’s only access to space should stay in operation until suitably replaced by a new and well tested heavy-lift vehicle,” Glenn said in the statement.“The shuttle system is working extremely well, has had systems upgrades through the years and has had ‘the bugs’ worked out of it through many years of use.”Added Glenn: “The shuttle is probably the most complex vehicle ever assembled and flies in the harshest of environments.Why terminate a perfectly good system that has been made more safe and reliable through many years of development?”Other astronauts, including Apollo 11 lunar module pilot Buzz Aldrin, also have advocated continuing U.S. shuttles flights until a replacement is fielded. Under a plan approved in 2004, the shuttle program is scheduled to end after two remaining flights. Another flight is possible if Congress approves funding.Each U.S. shuttle flight costs about $400 million. Under NASA’s current contract with the Russian space agency, flights to and from the space station aboard a Russian space craft will cost an estimated $55.8 million per U.S. astronaut.Glenn argued that the current plan to replace the shuttle by ferrying astronauts aboard Soyuz will yield little or no savings while delaying U.S. access to space for at least eight years. Along with extending the shuttle program as a way to assure U.S. access to the space station, Glenn said commercial launchers should be phased in “only as they become experienced and have proven reliability.” The [Falcon 9 medium-lift rocket](http://www.eetimes.com/showArticle.jhtml?articleID=225401344)was successfully tested by NASA contractor SpaceX in May, but critics argue that inexperienced vendors have a long way to go to ensure the safety of future manned flights to low-Earth orbit.Glenn also called for boosting research aboard the space station and using the orbiting lab to train astronauts for future missions to Mars. He added that the U.S. must accelerate development of the heavy-lift launcher to take astronauts beyond Earth orbit.

### US shuttles key – Russia will cut us off/ A2: Russia solves

Krauthammer ‘10 (Charles, MD and Pulitzer Prize-Winning Columnist, 3/12/10, “Closing the New Frontier”, http://culberson.house.gov/preserving-americas-leadership-in-space/)

The Russians may be new at capitalism, but they know how it works. When you have a monopoly, you charge monopoly prices. Within months, Russia will have a monopoly on rides into space. By the end of this year, there will be no shuttle, no U.S. manned space program, no way for us to get into space. We’re not talking about Mars or the moon here. We’re talking about low-Earth orbit, which the United States has dominated for nearly half a century and from which it is now retiring with nary a whimper. Our absence from low-Earth orbit was meant to last a few years, the interval between the retirement of the fatally fragile space shuttle and its replacement with the Constellation program (Ares booster, Orion capsule, Altair lunar lander) to take astronauts more cheaply and safely back to space. But the Obama 2011 budget kills Constellation. Instead, we shall have nothing. For the first time since John Glenn flew in 1962, the United States will have no access of its own for humans into space — and no prospect of getting there in the foreseeable future.

A2: Russia

### Ending of US shuttle program will give a perception of US weakness

WCT (Want China Times) 12/18/10, Chinese newspaper from Taiwan, “China Moving Ahead in Space Technology, US Slipping Behind: Report”, http://www.wantchinatimes.com/news-subclass-cnt.aspx?cid=1101&MainCatID=11&id=20101218000022

On the other hand, the US space shuttle fleet will be retired in 2011 and the US will rely on commercial spaceships for orbital flights, according to Space.com. Joan Johnson-Freese, chairwoman of the department of national security studies at the Naval War College in Newport, Rhode Island, told a Space.com reporter that "there is the perception that China is somehow getting ahead, that the US is slipping behind."China launched its second unmanned lunar probe, Chang'e 2, on Oct. 1 and it is currently in orbit around the moon. China also plans to launch its first unmanned space station module, Tiangong 1, in 2011. US experts believe that China is planning to send people to the moon but are proceeding in a low-key manner. "They [China] want to have all the building blocks in place for success before that's announced," Johnson-Freese said. Furthermore, China also plans to launch a spacecraft to Mars, according to Xinhua, China's state-run media. China's Mars probe, Yinghuo 1, is scheduled to be launched in 2011. The launch is a part of Chinese-Russian joint exploration of Mars together with the Russian Phobos-Grunt spacecraft. With the US unwilling to cooperate with China in space exploration, China has moved to expand its ties with other countries to develop space technology. "Canada, Europe and Russia are all banging on the door for China to work with them. I certainly have a concern that the US is going to end up the odd man out in terms of the globalization of space," Johnson-Freese told Space.com.

### Early shuttle retirement forces dependence on Russia - creates dangerous vulnerability to manipulation

Randy Tucker, staff writer for Dayton Daily News, 4/10/11, “After shuttle, U.S. would pay Russia for space access”, <http://www.daytondailynews.com/news/dayton-news/after-shuttle-u-s-would-pay-russia-for-space-access-1132215.html?cxtype=rss_local-news>

Shelving the shuttle program has also forced NASA to rely on Russia’s space agency, Roscosmos, which recently agreed to transport American astronauts to the International Space Station on its Soyuz space capsule at a cost of about $63 million per seat. Dependence on Russia puts the United States in a precarious situation, said Brown, who pointed out that NASA has relied on the Russians before to send Americans into space following the two-year grounding of U.S. spacecraft after the 2003 space shuttle Columbia disaster. “They (Russians) agreed to give us so many seats (on their spacecraft) at a fixed price, but they raised the price once we were no longer flying,” Brown said. “I’m very concerned that we’re again putting ourselves in kind of a hostage situation, where once the shuttle fleet is retired and on display in different museums, they can charge anything they want.” Russia may already be flexing its muscle in space, forcing the postponement of the final launch of the space shuttle Endeavour because the original launch date slated for Friday conflicted with Russia’s plans to send a cargo ship to the International Space Station. The Endeavour is now scheduled to lift off on April 29. “I think it’s a shame that our country allowed us to be in this situation,” said Michael Heil, president of the Ohio Aerospace Institute in Cleveland. “But I view it as being temporary.”

A2: Russia

### Space program needed to maintain US space power

DBNJ, The Daytona Beach News-Journal, 2/25/11, “Space mission still crucial for nation, Volusia County”, <http://www.news-journalonline.com/opinion/editorials/n-j-editorials/2011/02/25/space-mission-still-crucial-for-nation-volusia-county.html>

The federal government will end the space shuttle program in 2012. But space research and technology will never be ready for mothballs, and NASA must keep planning for more adventures in space, both manned and unmanned. Even so, NASA is in the midst of a painful transition. When the federal government ended future funding for the space shuttle program, the pain was felt in Volusia County. As many as 250 Volusia County workers and a total of 9,100 Floridians work for the shuttle program. Last November, about 1,000 workers at the Kennedy Space Center were laid off. As many as 7,000 workers, mostly private sector workers associated with the shuttle program, may have to move on. That is a sobering statistic. But the space program based at the center must go on, and not just because the space center is crucial to the regional economy. The United States cannot afford to become a second-rate power in space exploration and space technology. In the 1950s, when the Soviet Union beat the United States into space by launching Sputnik, the nation rose to the challenge. Our leaders looked to the moon and said, "We will beat you in getting there." And we did. Now, the Soviet Union is gone, but the role of space in our telecommunications and economic development is greater than ever. Science, research and commerce are the new factors driving space exploration.

### Russian space monopoly holds leverage over US diplomatic action making it difficult for US to take stance against Russia

Lara Farrar, For CNN, 8/14/08, “Experts: Reliance on Russia makes NASA weak”, <http://articles.cnn.com/2008-08-14/tech/nasa.russia.soyuz_1_international-space-station-russian-soyuz-space-program?_s=PM:TECH>

Experts are growing increasingly concerned that the United States will have to rely entirely upon Russia to take astronauts to and from the international space station for at least five years. Observers say the situation is all the more worrying as after NASA announced a delay in the launch of its next-generation Orion spacecraft. NASA's dependency upon the Russian Soyuz space capsules and rockets to carry astronauts to the station is the result of a five-year gap between the scheduled retirement of the shuttle in 2010 and the debut of its replacement in 2015. The agency had hoped it could narrow this gap by accelerating the initial launch of the craft to 2013 but announced Monday that because of inadequate funding and technical issues, the Constellation space program would not be ready for testing until September 2014. Although the new date is still within the March 2015 absolute deadline, many experts say NASA's reliance upon Russia to take astronauts into space has placed the agency in an unnecessary position. "It is a vulnerability," said John Logsdon, director of the space policy institute at George Washington University. "Any time you are relying on a single system to do a critical task, you are vulnerable if that system has problems. "It is our fault for not having a replacement for the shuttle much earlier than Orion will be available. It puts Russia in a very powerful position," Logsdon said. Although China has launched an astronaut into space in 2003, it still doesn't have the launching capabilities of the U.S. and Russia. But its space infrastructure is fast developing. According to Howard McCurdy, a space expert at American University in Washington, Russia will be the only country capable of providing human access to space not only for the Americans but for the rest of the world in the near future. "It is like a monopoly position where you are at the mercy of that supplier," McCurdy said. "You don't want to be dependent on a single provider, no matter who it is." McCurdy warned that because the United States has positioned itself to be completely dependent on Russia to get humans into space until 2015, it may be harder for the American government to take diplomatic action against the country, especially in light of recent tensions between Russia and Georgia. "That is a real concern," McCurdy said. "You are much more reluctant to be nasty with somebody who is a sole provider of an essential service.

A2: Russia

### RUSSIAN ROCKETS ARE AN INSUFFICIENT REPLACEMENT FOR THE U.S. SHUTTLES

Hutcheson, Ashley. 2004. ((Ashley Hutcheson is Professor at the University of Illinois College of Law)"DOLLARS AND SENSE: WHY THE INTERNATIONAL SPACE STATION IS A BETTER INVESTMENT THAN DEEP SPACE EXPLORATION FOR NASA IN A POST-COLUMBIA WORLD ." JOURNAL OF LAW, TECHNOLOGY & POLICY 2. (2004): 309. Web.)jk

The United States and its ISS partners are concerned about maintaining construction schedules, continuing research, and supplying the space station while the NASA shuttle fleet is grounded. The only available transports are the Russian Progress cargo vehicles and three- passenger Soyuz crafts, which are poorly funded and insufficient to supplant the NASA shuttles that hold seven passengers and large quantities of fuel and payload (e.g., construction materials, instruments, and vital living supplies). The ISS must remain manned despite these setbacks. The last shuttle mission to the ISS was Endeavor’s Expedition 6 journey in November 2002, and the Russian Soyuz has continued to transport crews every six months since May 2003.

### Russia taking advantage of US dependence to access ISS by increasing price

ET, EarthTimes, 2/9/10, “Russia to take advantage of US dependency on space shuttle”, [http://www.earthtimes.org/articles/news/308300,russia-to-take-advantage-of-us-dependency-on-space-shuttle.html](http://www.earthtimes.org/articles/news/308300%2Crussia-to-take-advantage-of-us-dependency-on-space-shuttle.html)

Moscow - Russia is planning to make more money out of ferrying US astronauts into space with its "Soyuz" capsule when NASA retires its Space Shuttles at the end of 2010, Russian space agency chief Anatoli Perminov said Tuesday. Russia, which has a contract with the US to transport astronauts to the international space station (ISS), will greatly increase its charges from 2012, Perminov told Russian news agency Interfax. He did not give any exact figures. The US is currently paying 306 million dollars for the use of Russian space shuttles in 2010 and 2011. Russia hopes to boost its share of the market in space technology with the profits. The launch of 17-year-old NASA shuttle Endeavour on Sunday, with six astronauts aboard, was its fifth last. NASA will retire its fleet of space shuttles at the end of the year. A replacement model will not be operational for at least another seven years.

A2: Russia

### Dependence on Russia vulnerable to extortion and allows Russia to take control of the ISS

Reed 10 (Keith Reed, economy analyst for NPR and the Boston Globe.7-20-2010. “U.S. National Security, the Space Station and Scrapping the Space Shuttles.” http://www.savemannedspace.com/2010/07/national-security-threat-to-lives-on.html)

Unremarked in the news are the national security dangers in giving Russia an absolute monopoly on US crew launches to the space station (ISS) after the space shuttle program is scrapped and until the time private launch systems are available.After the final space shuttle mission, the US will be completely dependent upon Russian launches to the station, opening up the US to potential extortion by an increasingly aggressive Russia to demand concessions in US foreign, economic, trade and defense policies to continue providing launches. Russia has already taken advantage of their upcoming monopoly by doubling the price for launches. This is international cooperation?Troubling signs: Russia's initial reaction to the discovery of the 10 Russian spies in the US was to blame us for discovering their spies, not apologizing for spying on us. Also, Russiacut off natural gas to Europe in a dispute with the Ukraine. Who would rule out any possibility of Russian 'leverage?' Suppose there is a foreign policy crisis, a war,or Russia invades a former USSR republic--what price in US policy might Moscow extract to keep launching our crew, or to even allow US crews to ever use the station again?Should relations in a crisis or war become bad enough, might Russia declare ownership of the ISS, knowing they control all possible U.S. access? One clue may be in their aggressive actionsat the North Pole:Finally, the incident on July 2,2010where an unmannedRussian cargo ship completely missed the space station (later it was brought under control and docked) shows technical risks which could endanger the space station.Indeed it was a Russian Progress which crashed into the Russian Mir space station in 1997, almost causing it's destruction. The circumstances then were unusual, but illustrative of the potential for damage; for the July 2 Progress could have crashed into the ISS as easily as missing it entirely. The linked account of the 1997 incident is fascinating reading; showing the "right stuff" of astronaut Foale in computing how to stabilize the spinning station, and the entire crew in saving the station by fast action:There are many ways the US and its ISS partner Russia can and should cooperate in space and with ISS, however it is unwise for the United States to rely entirely upon Russian launches for a period of years.

A2: Russia

### The U.S. needs the space shuttle program for economic expansion and leadership. Reliance on Russia makes the U.S. a passenger, not a leader.

Walker 11 (Robert Walker, member of the Competitive Space Task Force and former American politician. 2-8-11. Framework for American Leadership, Innovation in Emerging Space Economy.http://www.competitivespace.org/press-releases/)

Retired Congressman and former Chairman of the House Science Committee Robert S. Walker remarked, “The Space Economy is emerging as the next great frontier for economic expansion and U.S. leadership. If we really want to ‘win the future’, we cannot abandon our commitment to space exploration and human spaceflight. The fastest path to space is not through Moscow, but through the American entrepreneur.” In recent years, between the long-planned retirement of the Space Shuttle and the cancellation of Constellation and NASA’s troubled Ares rocket program, the U.S. has grown increasingly reliant on the Russian Soyuz for transportation to and from the International Space Station costing taxpayers hundreds of millions of dollars over just the next few years. Rather than funding the Russian space program, the U.S. could be creating jobs at home by relying instead on America’s private space industry. America’s dependence on the Russian program is complicated by our foreign policy as we seek to discourage the Russians from aiding U.S. adversaries in the development of nuclear weaponry and missile technology. Said Rand Simberg, Chairman of the Competitive Space Task Force, “America cannot simply sit in the passenger seat and expect to lead. We need to pilot the ship. We need to lead the way.”The flawed assumption in the management of America’s space program, according to Task Force leaders, is that centralized five and ten-year plans through cost-plus contracts to selected contractors is the most efficient way to innovate and compete with the global space community. While the Task Force acknowledges this approach worked for the Apollo program, they point to recent successes and innovation in commercial space transportation, increased international competition and the limitations on government funding as catalysts for a new decentralized and entrepreneurial approach. Said Simberg, “Government can and should create a framework for American industry and individuals to pursue their ideals and dreams, and space should be no exception. By opening space up to the American people and their enterprises, NASA can ignite an economic, technological, and innovation renaissance, and the United States will regain its rightful place as the world leader in space.”

### RUSSIAN SPACECRAFT DON’T SOLVE. CAN’T RETURN ANYTHING FROM ISS TO EARTH

Behrens, Carl. 2009 (Carl E. Behrens is a Specialist in Energy Policy) ("The International Space Station and the Space Shuttle." Congressional Research Service (2009): 1. Web. <www.crs.gov>.)jk

The U.S. Space Shuttle, which first flew in April 1981, has been the major vehicle taking crews and cargo back and forth to ISS, but the shuttle system has encountered difficulties since the Columbia disaster in 2003. Russian Soyuz spacecraft are also used to take crews to and from ISS, and Russian Progress spacecraft deliver cargo, but cannot return anything to Earth, since they are not designed to survive reentry into the Earth’s atmosphere. A Soyuz is always attached to the station as a lifeboat in case of an emergency.

A2: Russia

### Relying on Russia strips US of control over transport

Todd Pheifer, 4/18/10, writer for Helium and college professor, “The problem with NASA relying on Russia's Soyuz capsule for travel to the International Space Station”, <http://www.helium.com/items/1808132-the-problem-with-nasa-relying-on-russias-soyuz-capsule-for-travel-to-the-international-space-station>

As the Space Shuttle program nears it's end, the United States is faced with an interesting situation. How does NASA run manned missions into orbit and more specifically, how do they get people to and from the International Space Station? Despite the relative ease of space travel in the movies, getting into space in real time is still a very complex process. While some would like to replace the Space Shuttle with another vehicle, budgetary constraints and changes of philosophy have made this a longer-term project. Building a new vehicle is not a simple process, and it certainly isn't cheap. The United States could theoretically keep using the Shuttle, but NASA does not want to risk running the Shuttle program too long to the point where more lives are lost. Therefore, NASA is turning to the Russian Soyuz capsule for a transport solution. With that in mind, here are a few problems with NASA relying on the Soyuz for travel to the International Space Station. It doesn't belong to you One pragmatic challenge for NASA is that the Soyuz vehicle does not belong to the United States. While there is a partnership and an understanding with Russia, it can be a hassle in terms of logistics when NASA cannot plan or control their own transport vehicle. Granted, it will make it less cumbersome for NASA in terms of doing maintenance on the Shuttle, but at the same time NASA will want to have some influence over the condition of the Soyuz. This may be a complicated interaction since countries do not always volunteer their proprietary information to each other.

### Russia will cut off US space access

Charles Krauthammer 2/12/10 , American Pulitzer Prize–winning syndicated columnist, political commentator, and physician, “Closing the New Frontier”, <http://culberson.house.gov/preserving-americas-leadership-in-space/>

“We have an agreement until 2012 that Russia will be responsible for this,” says Anatoly Perminov, head of the Russian space agency, about ferrying astronauts from other countries into low-Earth orbit. “But after that? Excuse me, but the prices should be absolutely different then!” The Russians may be new at capitalism, but they know how it works. When you have a monopoly, you charge monopoly prices. Within months, Russia will have a monopoly on rides into space. By the end of this year, there will be no shuttle, no U.S. manned space program, no way for us to get into space. We’re not talking about Mars or the moon here. We’re talking about low-Earth orbit, which the United States has dominated for nearly half a century and from which it is now retiring with nary a whimper. Our absence from low-Earth orbit was meant to last a few years, the interval between the retirement of the fatally fragile space shuttle and its replacement with the Constellation program (Ares booster, Orion capsule, Altair lunar lander) to take astronauts more cheaply and safely back to space. But the Obama 2011 budget kills Constellation. Instead, we shall have nothing. For the first time since John Glenn flew in 1962, the United States will have no access of its own for humans into space — and no prospect of getting there in the foreseeable future.

A2: Russia

### RUSSIAN SPACECRAFT CAN’T MATCH THE SHUTTLE

Abbey, George. 2010. ("Former JSC director George Abbey on Obama’s NASA speech spacephotopn.jpg NASA Johnson Space Center – Earth Sciences and Image Analysis." chron.om. Baker Institute , 4/15/2010. Web. <http://blog.chron.com/bakerblog/2010/04/former-jsc-director-george-abbey-on-obamas-nasa-speech/>.)jk

The lack of a space shuttle also severely compromises the future of the space station. The space shuttle remains the only way to get heavy and large payloads to the station and return large and heavy payloads back to Earth. The Russian Soyuz can ferry our astronauts to the station, but it lacks the capacity to transport large payloads to the station and from the station to Earth. President Obama’s decision to reach out to private companies to expand our capabilities to transport cargo and astronauts to space could well be of benefit in the long term. But none of the vehicles being considered by these companies will have the capability and flexibility available with the space shuttle.

### Reliance on Russia to get to the ISS leaves the US vulnerable to political manipulation and technological failure

Farrar, staff writer, CNN.com, quoting John Logsdon, director of the space policy institute at George Washington University, Howard McCurdy, a space expert at American University in Washington, and Bill Nelson, Florida senator, 8/14/08 (Lara, “Experts: Reliance on Russia makes NASA weak,” CNN, http://articles.cnn.com/2008-08-14/tech/nasa.russia.soyuz\_1\_international-space-station-russian-soyuz-space-program?\_s=PM:TECH.)

Experts are growing increasingly concerned that the United States will have to rely entirely upon Russia to take astronauts to and from the international space station for at least five years. Observers say the situation is all the more worrying as after NASA announced a delay in the launch of its next-generation Orion spacecraft. NASA's dependency upon the Russian Soyuz space capsules and rockets to carry astronauts to the station is the result of a five-year gap between the scheduled retirement of the shuttle in 2010 and the debut of its replacement in 2015. The agency had hoped it could narrow this gap by accelerating the initial launch of the craft to 2013 but announced Monday that because of inadequate funding and technical issues, the Constellation space program would not be ready for testing until September 2014. Although the new date is still within the March 2015 absolute deadline, many experts say NASA's reliance upon Russia to take astronauts into space has placed the agency in an unnecessary position. "It is a vulnerability," said John Logsdon, director of the space policy institute at George Washington University. "Any time you are relying on a single system to do a critical task, you are vulnerable if that system has problems. "It is our fault for not having a replacement for the shuttle much earlier than Orion will be available. It puts Russia in a very powerful position," Logsdon said. Although China has launched an astronaut into space in 2003, it still doesn't have the launching capabilities of the U.S. and Russia. But its space infrastructure is fast developing. According to Howard McCurdy, a space expert at American University in Washington, Russia will be the only country capable of providing human access to space not only for the Americans but for the rest of the world in the near future. "It is like a monopoly position where you are at the mercy of that supplier," McCurdy said. "You don't want to be <Continued>

A2: Russia

<Continued> dependent on a single provider, no matter who it is." McCurdy warned that because the United States has positioned itself to be completely dependent on Russia to get humans into space until 2015, it may be harder for the American government to take diplomatic action against the country, especially in light of recent tensions between Russia and Georgia. "That is a real concern," McCurdy said. "You are much more reluctant to be nasty with somebody who is a sole provider of an essential service. "We have other international arrangements with them that could be jeopardized by our reliance on them," McCurdy continued. "Everything from their foreign relations with ex-Soviet states to their role in economic summits." Does NASA's dependence on Russia bode badly for U.S. space program? For its part, NASA says it remains confident that diplomatic affairs between the two countries will not adversely impact the space agency's relationship with Russia. "While it is possible that government to government issues could potentially have an impact on other aspects of a relationship between nations including cooperative space exploration activities, NASA has no reason to believe that it will be unable to rely upon Roscosmos-provided Soyuz vehicles for future ISS activities," spokesman Michael Curie wrote in an e-mail statement to CNN. The threat of a breakdown in diplomatic relations is not the only one hanging over NASA's space program. Legislation passed in 2000 (now called the Iran, North Korea and Syria Nonproliferation Act) could soon bring an abrupt halt to NASA's partnership with the Russian Space Federation, Democratic Sen. Bill Nelson of Florida said. The law bans the United States from buying space technology from Russia unless the president determines that Russia is taking steps to prevent the proliferation of nuclear and missile technology to Iran. Congress waived the ban in 2005, allowing NASA to enter into a $719 million contract with the Russians for use of the Soyuz through 2011. NASA says it is renegotiating a new long-term contract for use of the Soyuz, but, according to Nelson, the success of that contract could depend on whether lawmakers decide to approve the waiver again. Election-year politics combined with increasing concerns about Iran and the ongoing crisis in Georgia all but guarantee that lawmakers will not vote for the exemption, Nelson said. That means NASA could lose access to the $100 billion space station unless it continues to fly the shuttle or strikes some sort of deal with another space agency willing to put forward money for additional Soyuz seats, the senator said. "It is a lose-lose situation," Nelson said. "If our relationship with Russia is strained, who knows if Russia will give us rides in the future?" Nelson asked. "Or if they give us rides, will they charge such an exorbitant price that it becomes blackmail?" Questions about the safety and reliability of the Soyuz have also been raised in recent months after two consecutive troublesome landings by space capsules, including in April with American astronaut Peggy Whitson on board. NASA has been working with Russian engineers to try to determine the cause of the dangerous descents but has failed come up with any concrete answers. But NASA officials say the space agency still believes that the Soyuz is a reliable transport system for its astronauts. "We do not have concerns," NASA spokesman Rob Navias said. "The Soyuz, which has been flying for decades now, is extremely reliable and is extremely capable." "We have been partnering with the Russians for decades now for space flights." The Russian Federal Space Agency, Roscosmos, could not be reached for comment on the matter.

A2: Russia

### If US-Russian relations fail we would be unable to reach the ISS and a second Cold War could break out

AFP, staff writers, 5/24/08 (“US-Russia chill threatens NASA space program,” http://afp.google.com/article/ALeqM5jEfaL\_ODFJDElBHmcspf6kpbJAqg.)

The chill left on US-Russian relations by Moscow's military incursion into Georgia could spell problems for future US access to the International Space Station, US experts said. The National Aeronautics and Space Administration will become dependent on flights to the ISS by Russia's Soyuz spacecraft when it retires the shuttle fleet that has long ferried US astronauts into space in 2010. NASA will only get its successor space vehicle, Orion, planned for a revival of trips to the moon, ready for flight in 2015 at the earliest. That leaves the needs of US astronauts visiting the ISS vulnerable to the possibility of a new Cold War between Washington and Moscow after Russia's powerful military overran much of Georgia two weeks ago in the dispute over South Ossetia. "If recent Russian actions are any indicator, a technical excuse to completely block US access to the ISS for geopolitical reasons would fit nicely into the Kremlin toolkit," Vincent Sabathier, an expert on human space exploration at the Center for Strategic and International Studies in Washington, told AFP. Sabathier noted that not only was the short Georgia war a serious thorn in relations, but also the US determination to set up in Poland and the Czech Republic its missile defense system, which Russia calls a threat to its military. "Almost immediately after the Czech Republic signed an agreement with the US to place missile defense tracking radar in its territory, oil supplies through the Druzhba pipeline to the central European country were reduced to a trickle ... ostensibly for technical reasons," Sabathier said. The end of the three-decade-old shuttle program leaves NASA with at least a five-year hole on which it will have to pay Russia's space agency to deliver and retrieve US astronauts and cargo to the ISS. That depends as well on the US Congress voting an exemption to a 2000 law that bans US government agencies from opening contracts with countries like Russia that are considered aiding Iran and North Korea, which the US has labelled supporters of terrorism. Even before the Georgia fighting erupted on August 8 there was opposition in the Congress to such an exemption, and now that has likely increased, according to Florida Democratic Senator Bill Nelson. "In an election year, it was going to be very difficult to get that waiver to pay hundreds of millions of dollars to an increasingly aggressive Russia," Nelson said. "Now, I'd say it's almost impossible." Nelson, who supports allowing NASA to contract the Soyuz, said that without the exemption the US could find itself in 2011 with no access to the 100-billion-dollar space station -- largely paid for by the United States. Because the ISS needs someone aboard all the time to keep it going, the situation, Nelson said, would mean leaving the station to "degrade and burn up on rentry, or with us ceding it to those who can get there." NASA's chief Michael Griffin told AFP just days before the Georgia conflict erupted that it was a "great concern" that something could happen to make Soyuz unavailable. "If anything at all in that five years period goes wrong with the Russian Soyuz, then we have no system to access the space station." But after the Russia invasion of Georgia, NASA downplayed the political risk, saying it has a long history of cooperation with the Russian Federal Space Agency (Roscosmos). "While it is possible that government-to-government issues could potentially have an impact on other aspects of a relationship between nations, including cooperative space exploration activities, NASA believes that it will be able to rely upon Roscosmos-provided Soyuz <Continued>

A2: Russia

<Continued> vehicles for future space station activities." John Logsdon of George Washington University's Space Policy Center expects Congress to allow the waiver, "as long as Russia can be said to be abiding by the terms of the cease-fire (in Georgia)." "There is an issue but I don't think it's so strong to prevent the waiver from passing, as long as Russian behavior is what it has been agreed to on Georgia," Logsdon told AFP. However, he said, "if the situation with Russia gets much worst, then it's very hard to project what might happen because again, there is really no viable alternative."

A2: Russia

### NO OTHER SPACECRAFT NOW OR IN THE NEAR FUTURE HAVE THE SHUTTLE’S CARGO CAPACITY.

Augustine, Norman (Chairman of the U.S. Human Spaceflight Plans Committee). 2009. ("SEEKING A HUMAN SPACEFLIGHT PROGRAM WORTHY OF A GREAT NATION." 2 Review of U.S. Human Spaceflight Plans Committee (2009): 53. Web. <legislative.nasa.gov/396093main\_HSF\_Cmte\_Final Report.pdf>.)jk

Just as important, by pursuing this option, the U.S. would dismantle a successful multilateral framework for international collaboration—a framework that could be extended in the future for other space projects. By limiting the time that the international partners could realize the return on their investments, the U.S. would be open to the accusation that it is an inconsiderate, if not unreliable, partner. It is unlikely that another international collaboration as broad and deep could be developed soon to replace the current one. New potential partners would be more likely to seek less ambitious bilateral relationships. The Committee’s informal consultations with various foreign partner agencies emphasized how important the participation of their astronauts and experiments on the ISS have been to their space activities and to securing public support for their entire space programs. Finally, there is broader domestic and international public opinion that will not unreasonably question whether it is sensible to terminate after five years of full use a project that took 25 years to build.

## Humans key/A2: Probes 1/4

### Human spaceflight is key to scientific, technological, and medical advancement

Fong, Centre for Aviation, Space and Extreme Environment Medicine, 2005.

(Kevin, “Human Spaceflight in the UK: the Cost of Non-participation”, Earth, Moon and Planets 94)

Mars and the Moon hold the answers to many questions we have about the history of the Earth and our solar system. Most importantly, the exploration of Mars could yield information about the origins of life itself (e.g. Hiscox, 2001) – knowledge as fundamental to the life science community as the study of particle physics is to physical science. This alone would be worth the eﬀort. But the human exploration of space will also bear fruits for engineers, geologists, clinicians and biologists (see Crawford, 2001, for a review). The promise of exotic new propulsion systems (Chang Dı´az, 2001), ﬁeld geology (Spudis, 2001), and advances in biotelemetry and non-invasive clinical monitoring (Ueno et al., 2003) are just a few examples, and others are given elsewhere in this volume. In the ﬁeld of life sciences weightlessness oﬀers an opportunity to study fundamental properties of many biological systems. It allows us to compare and contrast the physiology of space ﬂight with the terrestrial disease processes that it reversibly mimics, while furthering our understanding of both (Fong, 2004). This is because the use of the space environment to investigate physiology oﬀers a unique tool allowing biological systems to be studied at boundary conditions (Fong, 2001). The physiology of extreme physical environments, and microgravity in particular, has parallels with the process of ageing and critical illness (e.g. Paloski et al., 2004). Of speciﬁc interest are the eﬀects of microgravity upon the cardiovascular system (Zhang, 2001; Waters et al., 2002), muscle (Fitts et al., 2001; see also the contribution by Michael Rennie and Marco Narici elsewhere in this volume), bone (LeBlanc et al., 2000; Turner, 2000; Vico et al., 2000; Carmeliet et al., 2001), and the neurovestibular system (Lackner, 1992; Harm and Parker, 1994; Holstein et al., 1999; Reschke, 2002). Deconditioning in these systems has been heavily implicated in the aetiology of falls and hip fractures in the elderly (Paloski et al., 2004), something which costs the National Health Service an estimated £2 billion annually.

Humans key/A2: Probes 2/4

### Humans are superior to robots for space missions

Crawford, Department of Earth and Planetary Sciences, Birkbeck College, 2010 (Ian A., “Astrobiological Beneﬁts of Human Space Exploration,” Astrobiology 10, no. 6)

While some of the exploratory objectives of astrobiology can undoubtedly be met by suitably instrumented robotic probes, others would be greatly facilitated by a human presence, and some may be wholly impractical otherwise. Speciﬁcally, human planetary exploration would have the following scientiﬁc advantages over robotic missions: It would enable rapid on-the-spot decision making and prioritization of exploration activities, including more intelligent and efﬁcient collection of samples from a more diverse range of localities, and over wider geographic areas, than is likely to be practical with the use of robots alone (e.g., Spudis, 1992, 2001; Garvin, 2004; Snook et al., 2007). The Apollo experience demonstrated that astronauts, when suitably equipped with the means of surface mobility, are very efﬁcient at this task (e.g., Heiken et al., 1991). Garvin (2004) presented a detailed comparison of the relevant skills and abilities of humans and robots as explorers of planetary surfaces and found that humans out-perform robots according to most of the criteria considered. This conclusion is corroborated by direct ﬁeld comparisons of human and robotic exploration at planetary analog sites on Earth—reporting one such study, Snook et al. (2007 p 438) found that ‘‘humans could be 1–2 orders of magnitude more productive per unit time in exploration than future terrestrially controlled robots. Astronauts may be expected to make discoveries that would be overlooked by robots, owing to the uniquely human ability to recognize new observations or phenomena to be of importance even if not anticipated in advance (e.g., Cockell, 2004). The history of exploration on our own planet indicates that serendipitous discoveries are often among the most important, and the exploration of other planets is unlikely to be any different in this respect. Perhaps most importantly, human missions to other planetary bodies will permit the return to Earth of a much larger, and more diverse, quantity of samples for detailed analysis in terrestrial laboratories than is likely to be achieved robotically. One of the major, but often unspoken, beneﬁts of human planetary exploration is that, because the astronauts must return to Earth, a large quantity of geological samples can be returned with them. The Apollo haul alone was 382 kg, which comprised more than 2000 discrete samples (Heiken et al., 1991); nothing comparable has been, or is likely to be, achieved robotically. Human missions will facilitate the landing, operation, and maintenance of more massive and complex scientiﬁc equipment than is likely to be feasible robotically. Because human missions, by their very nature, must land a signiﬁcant amount of mass on planetary surfaces, the additional marginal cost of landing massive or bulky scientiﬁc equipment is relatively modest (as demonstrated by the range of equipment deployed by the Apollo missions; Heiken et al., 1991). Moreover, human beings are uniquely capable of maintaining and ‘‘troubleshooting’’ problems with complex equipment (of which the ﬁve successful repair and upgrade missions to the Hubble Space Telescope provide the best examples to date; NRC, 2005). A particular example relevant to future planetary exploration concerns drilling, which will have important astrobiological applications on both the Moon and Mars. In this context, Zacny et al. (2008) noted that ‘‘in the era of human exploration, sufﬁcient mass and real-time supervision should be available to carry out truly deep penetration of the subsurface of extraterrestrial bodies.’’ Last, but not least, the infrastructure developed to support human space exploration, especially the development of a heavy-lift launch capability, would have many other scientiﬁc applications. Examples of relevance to astrobiology include sophisticated robotic probes to the outer Solar System and the construction of large spacebased telescopes for the study of extrasolar planetary systems (NRC, 2009).\

Humans key/A2: Probes 3/4

### Manned spaceflight doesn’t endanger astronauts

Hauk, former astronaut and commander of STS-26, the first US spaceflight following the Challenger disaster, 6/1/03 (Richard, “Is it Worth the Risk?”, Air and Space Magazine, <http://www.airspacemag.com/space-exploration/cit-hauck.html?c=y&page=1>)

The obvious question is: Why do people take such risks, willingly exposing themselves to clear, palpable danger? It isn’t just astronauts. You might ask the same question of firefighters, police officers, and combat troops. Most have doubts, and are well aware of the risks inherent in their jobs. In fact, intelligent people will leave these professions when they recognize that their personal risk/reward ratio has tilted too far in the “risky” direction. I’m reminded of a story about a Navy pilot who reached that point while making a night carrier landing. Landing a jet on the deck of an aircraft carrier at night and in instrument conditions is certainly the most demanding piloting task I ever had to cope with. By contrast, I had an easier time making my first dead-stick landing in a space shuttle: It was November 1984, and even though my heart was in my throat, the day was clear, the surface winds were benign, and the two-and-a-half-mile-long runway that I could see from 100 miles away didn’t move an inch. It was tough, but it wasn’t a night carrier landing. Navy legend has it that on one inky night, approaching the ship, a pilot glanced out the left window and saw his wife and children sitting on the wing, staring at him with vacant eyes. Summoning all his courage, he focused intently on his instruments and brought his airplane down safely. Then he immediately strode down to his squadron commander’s cabin and handed in his wings. Rather than disparage the man as a quitter, I admire him for recognizing his limits. It’s very likely that many aviators have died because they didn’t have the courage to admit to themselves—and to their colleagues—that they had reached that personal boundary. Back aboard Discovery, as the shuttle thundered into orbit, I was able to stop the awful speculation that would naturally spill out if I let it. At that point, we astronauts were along for the ride, with no real options other than to enjoy the thrill. I had launched twice before on the space shuttle, but was acutely aware of a key difference on this flight, mission STS-26. This time I couldn’t take comfort in the fact that NASA had never lost a crew to an inflight accident. Challenger was on all of our minds. Still, I was convinced that this would be the safest shuttle flight ever, and had told my family so before the launch. NASA had spent the previous 20 months not only fixing the O-ring seal problem that had caused the Challenger accident, but studying in minute detail other shuttle systems to minimize the likelihood that another serious problem was lurking. The agency’s safety and quality control programs had been overhauled. Astronauts had been placed in management positions to ensure that throughout the decision process, the crew’s voice was heard. For me anyway, there was a personal element to this sense of confidence. I was comforted knowing that my good friend Dick Truly had painstakingly overseen the Challenger reconstruction, and that Bob Crippen, who had commanded my first shuttle flight, was head of the review panel that had deemed our mission ready for flight just the day before. Tens of thousands of NASA and contractor employees had dedicated themselves to resurrecting the shuttle program. At the same time, I knew that there’s no such thing as perfection. Our safe return was not guaranteed. That Discovery mission was designed to be as benign as possible. Get up and back safely, proving that NASA was back in the spaceflight business. And so we did. Now, in the wake of the Columbia tragedy, we once again hear it debated: Is spaceflight worth the risk? I’ve been asked that several times since February 1, but I think the question needs to be more precise. What risk are we talking about? As a taxpayer who shoulders part of the financial burden of this grand enterprise, you should certainly get a vote on how the money is spent. But are you questioning whether I should risk my own life? My family has a right to weigh in on that—after all, they have huge emotional, and even financial, stakes in my decision. But why should you get a vote? Please leave matters of risk up to the astronauts and their families. They’ve made their choice. The families of the Columbia crew said it eloquently in a joint statement written under the most difficult of circumstances, days after their tragic loss: “Although we grieve deeply, as do the families of Apollo 1 and Challenger before us, the bold exploration of space must go on. Once the root cause of this tragedy is found and corrected, the legacy of Columbia must carry on—for the benefit of our children and yours.” The authors of that statement are painfully aware that astronauts take risks. They also know the real rewards of participating in a great adventure, of advancing frontiers and serving one’s country in the company of extraordinary colleagues. Only by taking such risks is society rewarded with increased knowledge and a sense of forward motion. And that, in the end, is what makes the risk worthwhile.

Humans key/A2: Probes 4/4

### SPACE EXPLORATION IS ONLY POSSIBLE WITH HUMAN PRESENCE. ROBOTS DON’T CUT IT

Schmidt, Greg, and Mike Hawes, 1999. ((Greg Schmidt is co-lead of the new Astrobiology Advanced Concepts and Technologies program at NASA and Mike Hawes is Chief Engineer and Deputy Director for Requirements for the International Space Station Program at NASA). "Robots Vs Humans in space: BOTH will be required." The Astrobiology Web. National Space Society, 1999. Web. <http://www.astrobiology.com/adastra/robots.vs.humans.html>.)jk

When further analysis of something actually requires human proximity, then the decision is made as to whether to bring the sample to the base or to send a human out to the sample. If need be, we then hop in our Mars buggy and drive wherever we need. With all of these possibilities, and the scores of additional ones, the only way to truly explore for life is with humans in the loop - not just on Earth, but on Mars. One of the clear lessons of our past 40 years in space is that humans will always lead the charge in exploration. Clearly, our tools are becoming more intelligent all the time, extending our reach into places that we'd scarcely dreamed of only a handful of years ago. But if we're serious about looking for life beyond our own home, our enthusiasm with these tools must be tempered by the knowledge that they are only extensions of ourselves. Tools, are, after all, only tools. Humans have always used tools to extend their biological capabilities. Whenever a tool has been developed to visit places where humans cannot go unaided, be it space or the abyssal depths of the ocean, humans have always followed. Yet often times, tools such as robots are developed only after humans have already accomplished a task in person. Automated airplanes and remotely operated submersibles are obvious examples.

## A2: Privatization CP 1/4

### US commitment to the shuttle program must precede privatized ISS efforts

Synder, aerospace engineer on the space shuttle program in Houston, 5/17/10 (Mike, “This is no Time to Retire Shuttle,” www.spacenews.com.)

There has been much discussion and debate about commercial providers’ taking over the role that the space shuttle was always intended to perform. This is a worthy goal that I support for many reasons, but these vehicles do not exist and are not operational today. However, if the United States allows the international space station to degrade or not realize its full potential, the business case for these commercial providers degrades as well. An extension of the space shuttle program prevents this. Once commercial providers are operational and have verified their performance, that would be — and should be — the trigger for space shuttle retirement. If we turn our back on spaceflight without any near- or long-term plan and outsource our immediate needs to other nations, it will be a sad day for the United States — perhaps an indicator that this great nation truly is in decline.

### Private companies can’t take over manned spaceflight efforts

Krauthammer ‘10 (Charles, MD and Pulitzer Prize-Winning Columnist, 3/12/10, “Closing the New Frontier”, http://culberson.house.gov/preserving-americas-leadership-in-space/)

Of course, the administration presents the abdication as a great leap forward: Launching humans will be turned over to the private sector, while NASA’s efforts will be directed toward landing on Mars. This is nonsense. It would be swell for private companies to take over launching astronauts. But they cannot do it. It’s too expensive. It’s too experimental. And the safety standards for getting people up and down reliably are just unreachably high. Sure, decades from now there will be a robust private space-travel industry. But that is a long time. In the interim, space will be owned by Russia and then China. The president waxes seriously nationalist at the thought of China or India surpassing us in speculative “clean energy.” Yet he is quite prepared to gratuitously give up our spectacular lead in human space exploration.

A2: Privatization CP 2/4

### Commercial spacecraft are inferior to the shuttle due to limited cargo capacity – can’t solve ISS

Dowd, senior fellow with the Fraser Institute, 8/3/09 (Alan W., “Surrendering Outer Space,” Policy Review No. 156, http://www.hoover.org/publications/policy-review/article/5421.)

The alternatives leave much to be desired and, as the above scenarios underscore, much to worry about. Griffin believes commercial cargo transport services from European, Japanese, and U.S. firms will be available in the coming years, but there will still be a gap during which the U.S. will have no way of transporting U.S. astronauts into space in U.S. spacecraft. Moreover, although nasa recently awarded Space Exploration Technologies (Spacex) a contract for launches through December 2012, it’s worth noting that there are limitations to what private firms can do: The Spacex Falcon 9 is expected to carry 22,000 pounds into space. By contrast, the shuttle can deliver a 65,000-pound payload into orbit. Moreover, a Space x Falcon 1 rocket carrying payloads for nasa and the Department of Defense failed in August 2008, its third failure since 2006.12 A Washington Post analysis notes that Europe’s Automated Transfer Vehicle is a possible alternative. “We believe we can be an important part of the solution for the space station and counterbalance to the Russians, if we are given a chance,” said Jean Yves Le Gall, who heads the firm that operates the European Space Agency’s (esa) launchers. The esa rocket is expensive, however, and largely unproven, especially when compared to the shuttle or Russia’s delivery vehicles. Moreover, the esa is still mulling whether and when to begin a manned space program. Citing the needs of the International Space Station, in which the U.S. has invested some $35 billion since the 1980s, the gaohas concluded that extending the shuttle’s life may be the most prudent course of action. That would require investing more in nasa. Congress began that process late last year, and Obama’s space-policy paper says he is “committed to making the necessary investments to ensure we close this gap as much as is technically feasible.” However, from wars to Wall Street bailouts, one wonders how much more there is to invest — and how strong the new administration’s commitment to closing the gap will be, given the priorities and problems lined up ahead of the shuttle.

### Ending shuttle program hurts US leadership – private sector doesn’t solve primacy

Brittany Sauser 3/1/10 space technology reporter at TR., “NASA's New Plan Faces Stiff Opposition”, http://www.technologyreview.com/blog/deltav/24872/

Some congressional members are questioning NASA's new direction, which calls for the Constellation program and the development of the Ares I rocket to be canceled, and for the agency to rely instead on commercial rockets to ferry astronauts into orbit. These members argue that such drastic changes could threaten America's leadership, and the very existence of the U.S. human spaceflight program. NASA administrator, Charles Bolden Jr., has said that Mars remains the ultimate goal of human space exploration, and that the new program is designed to make it possible to send astronauts there sooner. But even with an "infinite pot of money", he said, humans could not reach Mars within ten years. The concerns discussed during the congressional meetings focused on the plans' lack of a clear objective, and the assumption that a commercial rocket is better than a government built system, according to Aviation Week. Bart Gordon, the democrat representative from Tennessee and chairman of the House science panel, said he fears that the companies that take over U.S. crew transport operations will become "too important to fail," and could require government bailouts, according to the Aviation Week report.

A2: Privatization CP 3/4

### Turn - the ISS is key to spurring the private sector

Hauser, Marty. 2009. ((Marty Hauser is the VP of Research and Analysis of the Space Foundation)"The International Space Station: Decicion 2015." Space Foundation (2009): 9.)jk

Benefits to science from basic research advancements are only one aspect of how the ISS can contribute to technological innovation. The space program is one of the most well-known sources of advanced technological research in the country. In the process of researching and designing very complex space systems, advances are made that have benefits outside the space program. The NASA Innovative Partnerships Program (IPP) helps transition these advances into the private sector, benefiting global competition and the economy. Research associated with the development of the ISS, in particular, has contributed greatly to this phenomenon. For example, technology developed to recycle wastewater on the ISS has led to the creation of a filtration system with the ability to purify water from the most challenging water sources. This could have important impacts in remote areas where well water is heavily contaminated by bacteria and it is already being used to purify the water supplies of hospitals in the developing world and dental practices in developed nations. Other technologies derived from work on the ISS include air purifiers, biosensors, and advanced fire alarms. ISS-inspired technology can be found in the most unlikely places: wireless sensors developed for the program can now be found monitoring the structural integrity of three tunnels in the Netherlands. The companies associated with these advances are often partnered with NASA as part of the agency’s Small Business Innovation Research (SBIR) program. The success of small businesses is essential to innovation and growth in the economy. Moreover, although some of these companies are based in states such as Texas, Florida, and California, which are often associated with the space program, others reside in a wide variety of states, including New York, Oregon, Virginia, Montana, Pennsylvania, Arizona, Georgia, Connecticut, Michigan, Colorado, Massachusetts, New Mexico, Maryland, Nevada, and New Hampshire. The ISS has already proven to be an efficient engine for the creation of new, advanced technologies. The longer the program continues, the greater the likelihood that even more technologies will be developed to benefit the United States, and people worldwide.

A2: Privatization CP 4/4

### Turn - Private cargo transport to the ISS is more expensive than the shuttle and draws away money from future programs

Smith, founder and editor of SpacePolicyOnline.com, space policy analyst for almost four decades, and member of the Congressional Research Service on Capitol Hill for 31 years, 5/26/11 (Marcia, “Commercial Cargo Will Cost More Than Shuttle-Delivered Cargo Says Congressional Document,” http://spacepolicyonline.com/pages/index.php?option=com\_content&view=article&id=1592:commercial-cargo-will-cost-more-than-shuttle-delivered-cargo-says-congressional-document&catid=83:news&Itemid=76.)

Data contained in the charter for today's House Science, Space and Technology subcommittee hearing on commercial cargo show that on a cost per pound basis, commercial cargo will cost more than cargo delivered to the International Space Station (ISS) by either the U.S. space shuttle or Russia's Progress automated cargo spacecraft. The hearing is set to begin at 10:00 am this morning. The hearing charter, prepared by committee staff, contains a table showing that the Commercial Resupply Services (CRS) NASA is purchasing from SpaceX and Orbital Sciences Corp. will cost $26,700 per pound to ISS. By comparison, the cost for launch on the shuttle is $21,268 and on Russia's Progress is $18,149. The table explains the assumptions that went into those calculations, including the fact that they do not include development costs, are considered proprietary information by the companies, and the shuttle costs assume four flights per year with a capability to deliver 16 metric tons to the ISS at a total annual program cost of $3 billion. The document notes further that the costs for CRS would be higher if they were calculated the same way the shuttle costs were derived, by dividing the total CRS program cost by the mass delivered to the ISS. That cost would be $39,700 per pound. Other figures in the charter show that NASA will have spent $1.254 billion on commercial cargo by the end of FY2011 and its budget projections call for spending just over $5 billion for CRS between FY2011 and FY2016. Committee staff also point out in the document that NASA was not supposed to sign contracts for any CRS until the companies had demonstrated their commercially-developed capabilities, but NASA has signed such contracts anyway and is using them to make progress payments to the companies. That means NASA "assumed significantly more risk for ensuring the success of the cargo providers," according to the document. One question raised in the document is what the path of the commercial cargo program portends for commercial crew. Committee and subcommittee members have expressed deep skepticism about whether the commercial sector is ready to provide crew transportation services to ISS ever since President Obama proposed shifting that responsibility from NASA to the commercial sector last year. Committee staff state in the charter that: "By purchasing CRS years before the COTS systems had been demonstrated, NASA assumed significantly more risk for ensuring the success of the cargo providers. NASA has indicated that they are 'too important to fail.' This concept has important policy and budgetary implications for future commercialization proposals such as the Administration's proposed commercial crew efforts. Administrator Bolden has repeatedly told Congress that NASA would do 'whatever it takes' to make these ventures succeed. According to briefings provided to Committee staff, 'NASA is depending on our commercial cargo partners. We need their COTS development efforts to succeed so that they can begin providing cargo resupply to the International Space Station...' Legitimate questions have been raised about this approach since it differs from what was originally intended to be a merit-based and market-based competition." The hearing is in 2318 Rayburn House Office Building. Witnesses are NASA's Associate Administrator for Space Operations, Bill Gerstenmaier; GAO's Cristina Chaplain; SpaceX's President Gwynne Shotwell; and Orbital's Senior Vice President and Deputy General Manager (and former astronaut) Frank Culbertson.

## A2: Spending DA 1/6

### The shuttle saves money – we don’t have the funds to pursue alternatives

Smith, former manager of Shuttle Systems Engineering at NASA’s Johnson Space Center in Houston, 2/8/09 (Glenn, “NASA Manned Space Program.”)

The shuttle is the safest launch vehicle ever, and is becoming more reliable and safer with each flight. It will be a long time and many test flights before a replacement launch vehicle is equal to or more reliable than the shuttle. We must keep shuttle flying until a cheaper and safer manned launch replacement is in place and proven. Also, realize that the shuttle provides other important functions: \*Significant cargo return \*Land landing like an airplane, instead of plopping down in the ocean under notoriously unreliable parachutes \*Delivery to orbit of significant payloads together with astronauts and manipulators needed for servicing missions to major facilities in orbit, like Hubble and Webb telescopes, and the ISS. References to the “aging shuttle” by the Bush Administration’s “jihad” and others because it has been in service for about 27 years are not warranted. Age itself is not an essential criterion: \* Three of the most useful and efficient military aircraft have been in service for over 50 years: B-52, C-130, KC-135 – and all are still in service. \* A significant part of the shuttle launch system is new on each launch (ET and most of the SRBs). \* The Orbiter spacecraft and main engines are given a complete inspection and minor overhaul after each flight and before the next one. A safer and cheaper alternative to the shuttle has been sought for years. Following the “faster, better, cheaper” theme of former NASA Administrator Dan Goldin, many thought, “We should be able to build a manned launch vehicle that would be cheaper and safer” than the shuttle. This was also implied in the CAIB report. People are discovering that it is not easy. There have been many attempts to develop a cheaper and safer manned launch system, but unfortunately all attempts failed, primarily for technical reasons. These programs were known as DC-X, Orient Express, National Aerospace Plane, Single Stage to Orbit, X-33, X-34, Venture Star, Space Launch Initiative and the Orbital Space Plane. More than $5 billion has been spent on these failed programs. This has not been the fault of contractors, who are always happy to take money to try to build whatever the government wants to buy. The current Constellation program requires unplanned major mods in SRBs and ET. A more efficient and economical use of shuttle components is needed. A Constellation program should be able to operate efficiently using existing shuttle components and concurrent with shuttle operations. It is obvious that more money is needed to keep the shuttle flying and continue with manned exploration development. If that money is not available, we must keep the shuttle flying and delay Constellation until a total program review is complete and money is available. A new manned exploration program should proceed on a schedule that is compatible with available funds.

### The ISS lab will be 100 times cheaper in 20 years – spending’s not an issue

Frantz, 8/13/11 (Simon, “Space adds new dimension to cancer research,” Genome Biology vol. 2, http://genomebiology.com/2001/2/8/spotlight-20010813-01.)

Many scientists argue the vast expenditure being pumped into the ISS remains unjustified. The project, in many ways a successor to the Russian Mir space station, is now several years behind schedule and billions of dollars over budget. It is also argued that the experiments planned for the ISS will produce reasonable science but that overall it is not worth the money. "Yes the science isn't cheap and yes there are practical limitations but now it's up there it should be used to the best of it's potential. The quality of the science earmarked for the ISS - and the ovarian cancer research can be included in this - is potentially some of the most important ever done, as these studies can't be done anywhere else, so it's worth paying good money to find these things out," says Fong. "And whilst I'm never going to say the ISS is value for money, it has to be remembered that this is still at an immature stage - it's three years into a 15 year project. But they estimate in 10 years time it will be 10 times cheaper and in 20 years time it will be 100 times cheaper, so when this becomes a mature project, it is likely this will become an effective platform for science."

A2: Spending DA 2/6

### NASA saves money on pensions if Shuttle Program continues

Jansen, staff writer, 6/16/11 (“Pensions for space shuttle workers take big bite of NASA budget,” http://www.floridatoday.com/article/20110616/NEWS02/106160323/Pensions-space-shuttle-workers-take-big-bite-NASA-budget?odyssey=nav|head.)

Pensions for thousands of shuttle workers threaten to consume a significant chunk of NASA's budget, but Florida lawmakers said Wednesday the costs are a commitment that must be honored. The shuttle program will end after next month's final flight of Atlantis. To close a gap in pension funding, President Barack Obama proposed a one-time cost of $548 million out of NASA's $18.7 billion budget for the fiscal year starting Oct. 1. "We all know times are tough right now," said Sen. Bill Nelson, D-Orlando, who flew on a shuttle mission in 1986. "But promises were made before times got tough. Look, these highly skilled folks stayed to the very end of the shuttle program. They're the ones who helped give us the Hubble telescope and the International Space Station. NASA needs to honor its commitment to them." NASA has routinely included pension funding as part of its contracting for the shuttle program. Dozens of contracts were consolidated into a single pact in 1996 with United Space Alliance, which Boeing and Lockheed Martin created to streamline the program. USA now has about 5,600 employees, down from a peak of nearly twice that many. About 3,300 of those employees work at Kennedy Space Center. But about 11,000 current and former workers qualify for the pension program. Money set aside and invested to pay the pensions has declined in value to the point where it is only about half what workers are owed. The $548 million federal request is intended to close that gap, a spokeswoman said. "The truth is that the shortfall in the fund is the result of weak market investment performance over the last decade," said Tracy Yates, spokeswoman for United Space Alliance. "USA has contributed more than the annual amount that the government could reimburse us for, under our contract." If Congress provides less than needed to fill the pension shortfall, NASA might have to divert funding from other priorities to close the gap. "NASA would have to provide those funds in some fashion," said Michael Curie, a NASA spokesman. "It's a combination of the downturn in the market and the end of the shuttle program that has brought us to this point today." Members of the House and Senate appropriations subcommittees that fund NASA didn't ask about the pension shortfall during recent hearings on the budget, giving no clue where pensions might rank among spending priorities. Congress already has cut hundreds of millions of dollars from NASA in the current fiscal year and further reductions are possible for next fiscal year. The House Appropriations Committee agreed to cut spending 6 percent in the bill covering NASA, although details among the various agencies must still be negotiated in coming months. But Florida lawmakers said the pension remains a federal commitment. Rep. Sandy Adams, R-Orlando, whose district includes Kennedy Space Center, will work with her colleagues in the House and on the space committee to keep the government's promise to laid-off workers, a spokeswoman said. Rep. Bill Posey, R-Rockledge, said he is working closely with appropriators to ensure that pensions are properly funded. "This is a longstanding issue that the committee has been well aware of for some time," Posey said.

A2: Spending DA 3/6

### Shuttles boost the economy overall – well worth the price

Synder, aerospace engineer on the space shuttle program in Houston, 5/17/10 (Mike, “This is no Time to Retire Shuttle,” www.spacenews.com.)

I understand the economic climate in which we live today. However, we must look at this as an investment, one that costs this nation approximately one-half of 1 percent of the federal budget for all of NASA yet returns so much to the economy as a whole. The space shuttle program is a fraction of that amount and can be made even more economically efficient while still protecting the safety of our astronauts. In a time when there is so much uncertainty about jobs and the role of the United States in the world, this is a small price to maintain American leadership at the space station and in spaceflight.

### NASA’s budget is too small to cause significant harm but big enough to create a massive amount of jobs, helping the economy.

The Ultimate Space Place 4

(The Ultimate Space Place Revised 02/02/04 “NASA spinoffs, space benefits, space history, NASA space spinoffs, NASA technology products” [http://www.thespacepl](http://www.thespacepl/)ace.com/nasa/spinoffs.html)

Out of a $2.4 trillion budget, less than 0.8% is spent on the entire space program! That's less than 1 penny for every dollar spent. The average American spends more of their budget on their cable bill, eating out or entertainment than this yet the benefits of space flight are remarkable. It has been conservatively estimated by U.S. space experts that for every dollar the U.S. spends on R and D in the space program, it receives $7 back in the form of corporate and personal income taxes from increased jobs and economic growth. Besides the obvious jobs created in the aerospace industry, thousands more are created by many other companies applying NASA technology in nonspace related areas that affect us daily. One cannot even begin to place a dollar value on the lives saved and improved lifestyles of the less fortunate. Space technology benefits everyone and a rising technological tide does raise all boats.

A2: Spending DA 4/6

### Econ impact is small compared to NASA’s  solvency for devastating impacts that guarantee extinction.

Economic Voice Staff 11

(Author: Economic Voice Staff June 25th, 2011 “Looking for threats from outer space”[http://www.economicvoice.com/looking-for-tunguska-threats-from-outer-space/5 0020889#axzz1QQ9DMdXy](http://www.economicvoice.com/looking-for-tunguska-threats-from-outer-space/5%200020889#axzz1QQ9DMdXy))

If you think that the worst that could happen to us is a run on the banks and economic meltdown then think again. This Monday 27th June 2011 a small asteroid will pass within 8,000 miles of the Earth, a mere hair’s breadth by astronomical standards. NASA’s Near Earth Object Observation Programme though is on the watch for those objects that threaten to actually collide with our planet. Their aim is to detect these threats as far ahead as possible, leaving us many years, if not decades or more, to work out how to prevent any collision.This month 103 years ago a large comet entered the atmosphere and caused an air burst over Podkamennaya Tunguska River, Siberia. As a result some 80 million trees were flattened. The trees nearest the epicentre were still standing but stripped as bare as telephone poles. Although no-one was reported to have died in this event in such a remote area, hundreds of the reindeer the locals relied on for their livelihood were killed. At the time the locals thought that they had been cursed by the god Ogdy and their reluctance to talk about it together with difficulties getting to the region meant that it took many years for investigators to find out what had happened. The first scientific team led by Leonid Kulik of the St Petersburg museum did not get to the area for 19 years. According to NASA the asteroid, which weighed in at 220 million pounds, hit the Earth’s atmosphere at 33,500 mph. The asteroid caused the air to heat to 44,500 degrees Fahrenheit and the asteroid released the energy equivalent of 185 Hiroshima ‘Little Boy’ bombs (this figure varies depending on which source you look at). The Little Boy yielded the equivalent of 13-18 kilotons of TNT. The asteroid did not actually hit the earth, but it disintegrated with such force that it flattened 20,000 square kilometres of woodland. So next time you hear politicians warning about how critical a few banks are just give this a thought.

A2: Spending DA 5/6

### NASA holds upward of 19000 jobs.

Atkinson 9

(by NANCY ATKINSON science journalist, published on Wired.com, Space.com, NASA’s Astrobiology Magazine on MAY 1, 2009 “NASA Begins Job Layoffs As Shuttle Retirement Looms” Cites Robert Block, Sentinel Space Editor [http://www](http://www/). universetoday.com/30242/nasa-begins-job-layoffs-as-shuttle-retirement-looms/)

NASA began the first round of job layoffs today as the space agency prepares to retire its fleet of space shuttles. 160 people were notified today their jobs were being cut, the first of 900 jobs that will evaporate in the next five months. The first wave of layoffs will affect Lockheed Martin and ATK Thiokol, contractors that support the shuttle program building fuel tanks and [rocket](http://www.universetoday.com/82633/rockets/) boosters in Louisiana and Utah. The shuttle program employs about 1,600 NASA civil servants across the space agency and 13,800 contractors around the country. Once the shuttle stops flying, as many as 6,500 jobs could be cut at the [Kennedy Space Center](http://www.universetoday.com/75905/kennedy-space-center/) alone.

### NASA key to the economy, technology advanced and hegemony

Smith 11

(By Josh Smith [National Journal](http://www.nationaljournal.com/) May 18, 2011 (received state, regional and national awards for his political and policy reporting) “As shuttle program winds down, uncertainty looms for NASA” http://www.govexec .com/dailyfed/0511/051811-shuttle-future.htm)

Reducing space budgets may be an attractive option, but in the long term it could hurt the U.S. economy, said Frank Slazer, vice president of the Aerospace Industries Association.

"While cutting the federal deficit is essential to assuring our economic future, cutting back on exploration investments is a penny-wise but pound-foolish approach that will have infinitesimal impact on the budget deficit," he said. "Cutting exploration further threatens our economic growth potential and risks our continued national technical leadership overall, even as emerging world powers increase their investments in this important arena." Space exploration has real impact back on earth, said Republican Sen. Marco Rubio, who represents Florida, which hosts the Kennedy Space Center and other NASA facilities and space industries. "America's space program is not something we simply do for fun," he said. "Many industries exist because of the space program." Rubio called for a better-defined goal for NASA. And losing the competitive edge in space could undermine American economic power and national security,” said Elliot Pulham, CEO of the Space Foundation.

### NASA’s Budget is small, no link. We spend more on total air-conditioning in the Middle East than we do on NASA.

NPR 11

(NPR STAFF June 25, 2011 “Among The Costs Of War: $20B In Air Conditioning” <http://www.npr.org/2011/06/25/137414737/among-the-costs-of-war-20b-in-air-conditioning?ps=cprs>)

The amount the U.S. military spends annually on air conditioning in Iraq and Afghanistan: $20.2 billion. That's more than NASA's budget. It's more than BP has paid so far for damage during the Gulf oil spill. It's what the G-8 has pledged to help foster new democracies in Egypt and Tunisia.

A2: Spending DA 6/6

### The cost is irrelevant, NASA’s projects are worth it.

Caleca 9

(BY BEN CALECA  Staff Writer for the Michigan Daily. Published January 8, 2009 “Ben Caleca: NASA’s Secret Success” <http://www.michigandaily.com/content/2009-01-09/column-ben-caleca>)

But no matter the cost, NASA’s projects are worth it. For every dollar put into NASA, the technology has developed returns several times over in new products in fields ranging from medicine to sportswear. And the average American gets to enjoy the benefits. The sensor systems developed for the over-budget Hubble Space Telescope are what allow you to document your night on the town with your digital camera. The expensive corrections made to the Hubble when it was found to be flawed turned out to be a boon for medical imaging systems, giving doctors the ability to detect cancers extremely early and saving countless lives a year. Of course, there are two big questions that always end up being asked: why not directly invest in medicine, and why not let the private sector handle space flight? The truth is that investing in one specific science doesn’t always give you the right answers. We fund medicine, we fund other fields, but it’s in the cross-section of these innovations that the most creative solutions to our problems are found. Diversity of thought and experience generates more overall knowledge and valuable lessons are learned even when the projects fail.

### The U.S. drives international interest in space exploration. If NASA’s cut, other programs will be too.

Chow ’11 (Denise, Space.com staff writer, 4/14/11, “NASA Faces Awkward, Unfortunate Spaceflight Gap”, http://www.space.com/11387-nasa-future-human-spaceflight-hurdles-nss27.html)

But NASA has a responsibility to continue its legacy of exploration, Simpson said, and human spaceflight is an inextricable part of that. "We cannot forget that from an international perspective, the world looks to us to lead," Simpson said. "They recognize that however they might disagree with what they see us do or hear us say, they expect us to build a pathway. They're afraid that if we lose our way, they lose their way. If we can't navigate our way through this, then civil space is not just in trouble here, it's in trouble in lots of other parts of the world." Simpson also emphasized the need to continue international cooperation in space, as was successfully demonstrated with the construction of the space station. These international relationships will not only be beneficial for space operations, but will also serve to inspire not only American citizens, but people all around the world, Simpson said. "The United States of America, not just NASA, needs to invest in going to interesting places and not just taking people and machines there, but taking human society off of Earth," Simpson said. "We've done that with the station. We have other places we need to do it. It is the future of exploration, but it is also the future of seizing the heart and soul and minds of the best and the brightest, not just here, but in many, many countries around the world."

## A2: Orion Solves

### Orion won’t reduce dependence on Russia

Coppinger, aerospace technology engineer, 6/3/07 (Rob, “Orion Lite won't reduce NASA Russian dependence,” http://www.flightglobal.com/blogs/hyperbola/2010/04/orion-lite-is-for-escape-only.html.)

Reading about president Barack Obama's decision to resurrect the Orion crew exploration vehicle as an escape capsule we are told (here and then here and in plenty of other articles) that this will reduce NASA's dependence upon Russian crew transport services This could not be more wrong. Russia has been providing all International Space Station (ISS) crew rotation flights since STS-129, the last Shuttle flight to do that job in November last year The ISS has six crew (yes Expedition 22 had only five crew) and for that Russia is providing four three-crew Energia Soyuz TMA spacecraft a year Orion Lite will not launch crew, it launches unmanned for an automatic rendezvous and docking with the International Space Station and then sits there, but until when? It is not needed for an emergency return. Soyuz have been docked to the station for the emergency return role ever since station has been inhabited. So Orion Lite is not reducing Russian flights to the station and it is simply not needed for the escape role If you were onboard ISS and needed to escape which vehicle would you want to get into, a Soyuz TMA or the Orion Lite? This blogger would take the tried and tested Soyuz every time Previously we have been told that the original Orion had been baselined as a four crew vehicle. If that is still the case for Orion Lite then if both of those Soyuz capsules fail during this ISS emergency it looks like the mission commander (Captain always goes down with the ship, right?) and one other unluckly individual have a problem this blogger doesn't want to contemplate It is true that the US has been "responsible" for crew emergency return under the ISS framework agreement for some time. Originally the Space Shuttle ferried X-38 was to have done this job. It was cancelled by President George W. Bush much to the annoyance if not anger of NASA's X-38 project partner the European Space Agency This blog will investigate further into NASA's ISS crew return responsibilities. Perhaps Orion Lite means NASA doesn't have to pay some sort of crew transport premium on those $51 million, now $56 milion, seat prices, because Soyuz was not supposed to be an escape capsule.

### Must use the space shuttle – alternatives are dangerous and expensive

Smith, former manager of Shuttle Systems Engineering at NASA’s Johnson Space Center in Houston, 1/5/09 (Glenn, “When to Retire Shuttle? - Safety Considerations,” Space News.)

It would be extremely difficult to successfully develop a practical abort system that would be effective in all the different mission phases of ascent, on-orbit and entry. An abort system covering only ascent flight in the atmosphere could be more attainable and could probably improve overall safety of a new launch system, though this remains to be proven. It is apparent that safely launching people into space will remain a very difficult and dangerous business. The space shuttle should continue to fly until a cheaper and safer vehicle is available and proven. It is interesting that the GAO selected the shuttle issue for special attention and early decision, even though the entire NASA budget is less than two-thirds of 1 percent of the federal budget. Perhaps one reason for this special interest may be that many people say, “The NASA space program is the one thing the federal government does that I am proud of.”

## A2: Politics

### Eliminating NASA programs unpopular in Congress

Mussenden 3 (Sean Mussenden, Media General News Service, award winning media journalist. 3-10-3. “Hometown Pork Compromises Efficiency at NASA.” http://www.seanmussenden.com/NASA.html)

Having complained about NASA's constant budget overruns, many in Congress welcomed the Strategic Resource Review. But some lawmakers worried about the effect elimination of a program -- or worse, a center -- would have on local jobs. For example, NASA considered closing wind tunnels at Virginia's Langley in 2001 and consolidating research between the Glenn center in Ohio and the Marshall center in Alabama in 1999. Both times, lawmakers representing those states demanded assurances from Goldin that their centers would not be targeted. Goldin told them not to worry. "Anything that has the possibility of reduction of staffing or closing of facilities makes Congress nervous or unhappy," said John Logsdon, director of the Space Policy Institute at George Washington University. "To take a national viewpoint -- what's good for space program as opposed to what's good for Kennedy [Space Center], Marshall or Johnson is asking legislators to behave unnaturally." Rep. Tom Feeney, a freshman Oviedo Republican who represents Kennedy Space Center, said he is not ashamed to put the concerns of Florida space workers first. "I think you always have to advocate where you can in good conscience for your constituents," he said. "When we can do it just as well or better in my district, I will say so."

### Republicans like the space shuttle program

The Economist 10 (The Economist. 7-22-10. <http://www.economist.com/blogs/democracyinamerica/2010/07/polling_2>)

U.S. space shuttle flights are nearing their end, but Americans wish they would continue. In the latest Economist/YouGov Poll they give NASA a positive rating and say the expense of putting men on the moon 40 years ago was worth it. Only 18% of Americans would end NASA's human space flight program (the last shuttle is scheduled to take off April 19). A majority favors continuing the space shuttle program, and there is also significant support for sending human missions to Mars and returning to the moon. Americans also favor having the government make grants to private companies to provide transit to the International Space Station (but just over a third say that it is likely that there will be commercial vehicles taking astronauts to the space station in the near future). There tends to be even more support for the space program from men, from younger adults, college graduates, and those who are economically better off. Republicans are more in favor of the program than are Democrats. And Republicans have more positive reactions to the 1969 mission to the moon: though 69% overall say that putting a man on the moon was worth the time, effort - and expense - 78% of Republicans think so. In fact, when it comes to spending money on the space program, Republicans - who view the federal budget deficit as second only to the economy as the country's most important problem - are more likely than Democrats to say that too little is being spent on space exploration.

## A2: Orion Solves 1/9

### Obama doesn’t need to spend political capital – Hutchinson will get the plan through Congress

Powell 10 (Stewart M Powell, writes for the Washington Bureau. 5-1-10. “Pitching for NASA: Hutchinson back in the Game” <http://www.chron.com/disp/story.mpl/nation/6984728.html> )

“Everybody expects politicians to back programs that benefit their states,” says Bill King, a lawyer with Bracewell & Giuliani in Houston serving on the board of Space Center Houston. “But Sen. Hutchison is building her argument on policy and sound technical issues to make her case much more persuasive.” Even though she serves in the minority party, Hutchison has outsized influence on Capitol Hill. The reason: She tends to avoid the red-meat rhetoric that discourages Democrats from joining her and would preclude the White House from working with her on compromises. Shunning partisan posturing in favor of digging into the details is standard operating procedure for a 17-year Senate veteran and University of Texas-trained lawyer who built a reputation as a behind-the-scenes operator, says Cal Jillson, a political scientist at SMU. “I think this fight has been a good vehicle for her to get up off the canvas and start counter-punching after her setback back home,” he said. Hutchison will publicly showcase her deepening concerns in May at a hearing by the 26-member Senate Commerce, Science and Transportation Committee where she is the senior Republican on the Democratic-led panel. The fate of human spaceflight capability and the space station are too important to rely merely on “rhetorical criticism” of the administration, especially when “the facts are solidly behind us,” Hutchison told the Chronicle. Sen. Bill Nelson, D-Fla., a space state ally, says “everybody who wants our country to have a robust space exploration program can appreciate the energy and dedication Sen. Hutchison brings to this debate.” Hutchison heads into her hearing hoping to build upon the backing of Sen. George LeMieux, R-Fla., and 20 House members from eight states, including Houston Democratic Reps. Gene Green and Sheila Jackson Lee, for NASA to stretch the timetable of the remaining shuttle flights and a fourth standby flight through 2012. Hutchison, who has already raised the alarming prospect of astronauts trapped in orbit, says the administration doesn't even know the individual items that might be needed aboard the space station or what launch vehicle will be able to deliver them. “This is not the way to ensure that a (presidential) decision and pronouncement to continue (space station) operations through 2020 will not become an empty gesture,” Hutchison insists. With the space shuttle scheduled to retire after a November flight, NASA stands to lose the 59-foot-long, trailer-truck sized cargo bay that can ferry almost 28 tons of equipment to the space station. Hutchison's return to the legislative struggle is “a shot in the arm” for NASA congressional efforts, says Green, the Republicans' go-to-Democrat on NASA within the mostly GOP Houston-area delegation

### Jobs will be lost when the shuttle program ends

Jordan 11 (Janelle Jordan, reporter for Central Florida News. 6-17-11. “Looking Beyond the Shuttle Program.” http://www.cfnews13.com/article/news/2011/june/264417/Florida-forward:-Looking-beyond-the-shuttle-program

The countdown to the final liftoff and the end of the space shuttle program is on. Shuttle Atlantis is set to mark its final flight into orbit July 8, ending the historic 30 year shuttle program. Friday, the focus turns to the future as Florida businesses and space industry leaders gather for a look ahead, with a panel discussion at the Church Street Ballroom, in downtown Orlando. The meeting comes as Atlantis sits on the pad and workers continue preparations for its final 12 day mission. Once Atlantis returns, thousands of jobs are expected to be lost. In April, United Space Alliance announced after the final launch, nearly 3,000 workers will lose their jobs and about 1,900 of those layoffs will be in Florida. Those job losses and the future of the space program will be among the discussion. Over 2,000 local businesses have been invited to participate. A number of space industry leaders are also taking part including NASA Deputy Administrator Lori Garver and Florida Senator, and former Astronaut Bill Nelson.

A2: Orion Solves 2/9

### Ending the shuttle program leads to dramatic job loss

Royse 8 (David Royse. Journalist for The Associated Press in Miami, Florida. 4-2-8. “Huge Job Losses After Shuttle Program Ends, NASA hints.” http://news.nationalgeographic.com/news/2008/04/080402-AP-nasa.html)

More than 8,000 NASA contractor jobs in the United States' manned space program could be eliminated after the space shuttle program is shut down in 2010, the U.S. space agency said Tuesday. The number of civil servants is expected to remain roughly the same. But dramatic job cuts are possible among private contractors as NASA transitions to the Constellation program, which is developing the next-generation vehicle and rockets to go to the moon and later to Mars. NASA acknowledged job losses could fluctuate depending on who's occupying the White House next year and on his or her support for space exploration. The bleakest forecast was issued for the flagship Kennedy Space Center at Cape Canaveral, Florida. Just 1,600 to 2,300 employees were expected to remain in 2011, a cut of up to 80 percent from the center's current 8,000 workers. The Michoud Assembly Facility near New Orleans, Louisiana, was forecast to lose as many as 1,300 of its 1,900 jobs. "Our greatest challenge over the next several years will be managing this extremely talented, experienced and geographically dispersed workforce as we transition from operating the space shuttle to utilizing the International Space Station," the report said. Nationally, NASA said the number of full-time civil servants in its manned space program would fall to about 4,100 in 2011, a loss of about 600 jobs from this year. Including outside contractors, the number of jobs would fall to an estimated 12,500 to 13,800. About 21,000 are currently employed. NASA said it could be more than a year before it has more dependable job forecasts.

### Eliminating NASA programs unpopular in Congress

Mussenden 3 (Sean Mussenden, Media General News Service, award winning media journalist. 3-10-3. “Hometown Pork Compromises Efficiency at NASA.” http://www.seanmussenden.com/NASA.html)

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A2: Orion Solves 3/9

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### Manned space program has bipartisan support

Taylor Dinerman 6/9/10, consists of various publications which include The Wall Street Journal, American Spectator, and Ad Astra. He currently writes for the Hudson Institute in New York and is a part-time consultant for the US Defense Department, “The Collapse of NASA?”, <http://www.hudson-ny.org/1366/the-collapse-of-nasa>

At one time, the US-manned space program was something that the overwhelming majority of Americans could be proud of; with a few exceptions, it enjoyed strong bipartisan and popular support. It has so much visibility that many people believe it gets as much as 20 percent of the federal budget, instead of the the real number which is a little more than one-half of one percent. Now it is the object of a nasty political squabble -- mostly between the White House and Congress as a whole, rather than between Republicans and Democrats. While a few leaders in Washington are seeking a compromise, the fight over Constellation has been getting nasty. Senator Richard Shelby (R Al.), the most eager supporter of the Moon Mission, may attach an amendment forbidding NASA to cancel the Constellation to a "must pass" military appropriations bill. This would insure the programs survival at least until 2012.

A2: Orion Solves 4/9

### Senator Hutchison pushing shuttle program

Space Plex 6/23/10, “Senator Hutchison Vigorously Supports John Glenn’s Push for a Shuttle Extension”, http://spaceplex.com/2010/06/23/senator-hutchison-vigorously-supports-john-glenns-push-for-a-shuttle-extension/

WASHINGTON, D.C. – Senator Kay Bailey Hutchison (R-Texas), the Ranking Member on the Senate Commerce, Science, and Transportation Committee, says she strongly supports former Ohio Senator and astronaut John Glenn’s statement highlighting the risks of relying only on the Russian Soyuz vehicles for American access to the International Space Station. Senator Hutchison has consistently stated that any compromise between the Constellation program and the President’s budget proposal should include a short-term extension of the shuttle program in order to protect the nation’s $100 billion investment in the space station. She noted that additional shuttle flights would sustain and utilize the space station to conduct ground-breaking research and help maintain the primary justification for continuing America’s human space flight capability. “Senator Glenn’s thoughtful comments come from someone with a deep connection to the space program and a strong understanding of the current political process through which we must find a compromise,” said Senator Hutchison.

### Strong senatorial support for job creation

Huffington Post 6/22/11, “Democratic Senators Call For Job Creation As Part Of Deficit Reduction Negotiations”, [http://www.huffingtonpost.com/2011/06/22/democratic-senators-job-creation-deficit-reduction\_n\_882215.html#](http://www.huffingtonpost.com/2011/06/22/democratic-senators-job-creation-deficit-reduction_n_882215.html)

WASHINGTON -- Leading Democratic senators called on Wednesday for a strengthened focus on job creation during the deficit reduction talks and asked their Republican colleagues to join them in support of legislation to boost job growth. "We need to continue to put jobs first, and we're continuing that on the floor of the United States Senate," said Senate Majority Leader Harry Reid (D-Nev.) at a Capitol Hill press conference that also featured Democratic Sens. Dick Durbin (Ill.), Charles Schumer (N.Y.), Patty Murray (Wash.), Debbie Stabenow (Mich.) and Mark Begich (Alaska).

### Ending of space shuttle program hurts jobs and economy

Jeff Harrington 6/26/11, editor and reporter at the St. Petersburg Times, “Space Coast jobs face uncertain future after end of shuttle program”, <http://www.tampabay.com/news/science/space/article1177218.ece>

Professor Vince Burns takes a long sip from his 7-Eleven Big Gulp and faces his class. ¶ Burns is one hour into a four-hour evening session on inspecting circuit boards. Four of the six students in his Brevard Community College classroom are eager to beef up their resumes after getting laid off from United Space Alliance, the NASA contractor that manages the space shuttle program. ¶ Don't worry if circuit boards you examine have a little extra soldering, Burns tells the group. Only worry about meeting commercial specifications, not more stringent NASA specs. ¶ "Remember," he says, "we're not working at NASA anymore." It may be the toughest lesson these students have to grasp. This is, after all, the Space Coast, a region whose pride and identity has been linked to space exploration ever since the federal government began buying 212 square miles filled with citrus groves in 1962 to create what became the Kennedy Space Center. The phaseout of the space shuttle this summer means more than the loss of at least 7,000 space-related jobs, more than a massive economic ripple hitting everything from restaurants to retailers, schools to scuba diving companies

A2: Orion Solves 5/9

### Job creation more popular in congress now than in 2 decades

Stephen Dinan 3/3/10, writer for The Washington Times, “Lawmakers cry 'jobs' to push through bills; Loud political chorus comes from both sides of the aisle”, found on lexis

It was a modest measure to designate several thousand beachfront acres of St. Croix as a National Historic Site, but in the hands of a skilled congressman such as Rep. Nick J. Rahall Enhanced Coverage LinkingNick J. Rahall -Search using: Biographies Plus News News, Most Recent 60 Days II, it became yet another jobs bill. Likewise the Travel Promotion Act, which would create a nonprofit group to push U.S. tourism, has been billed as a job-producing machine by Senate Majority Leader Harry Reid, Enhanced Coverage LinkingHarry Reid, -Search using: Biographies Plus News News, Most Recent 60 Days Nevada Democrat. It doesn't stop there - backers last week unveiled a bipartisan bill to create a visa category for entrepreneurs, predicting it "will create jobs in America." From immigration to clean energy to expanding the social safety net, there's no better way to grease the skids for new government programs in Washington nowadays than to declare them job-producing bills, then watch supporters line up and potential opposition crumble. When Mr. Reid dubbed as a jobs bill a simple $15 billion measure to offer payroll tax breaks and continued highway construction funding, it helped head off a potential Republican filibuster. Likewise, the Trade Promotion Act, which would tout the U.S. as an international tourist destination, sailed through the Senate after it was tagged with the almighty jobs-bill moniker. Given an unemployment rate hovering near 10 percent, the focus on jobs is not surprising. House and Senate lawmakers raised the jobs issue on the chamber floors at least 154 times over the past week, and the jobs issue is more popular in Congress now than it has been in nearly two decades - since the 1991-92 recession. President Obama Enhanced Coverage LinkingPresident Obama -Search using: Biographies Plus News News, Most Recent 60 Days joined the jobs chorus Tuesday, touting a $6 billion plan to offer up to $3,000 rebates for energy-efficiency home upgrades as "a common-sense approach that will help jump-start job creation."

### No link – space is politically insignificant

Foust, aerospace analyst, journalist and publisher, 4/11/11 (Jeff, “Whither human spaceflight?” http://www.thespacereview.com/article/1822/1.)

But in an era where the superpower competition that kicked off human spaceflight has end, the influence of prestige as a motivating factor wanes. Today, in the grander scheme of things, space policy is a minor issue that grabs the attention of only a small fraction of members of Congress, most of whom have a parochial interest in the topic because of the presence of NASA facilities in their states or districts. It’s telling that the space-related issue that has attracted the broadest degree of interest among members of Congress is where NASA will transfer the shuttle orbiters upon their retirement. “If you want to understand space policy, the first thing you have to understand about it is that it’s not important,” said Rand Simberg, chairman of the Competitive Space Task Force, in a talk at the Space Access ’11 conference in Phoenix on Saturday. “Nothing bad happens to anybody if we don’t meet a schedule in human spaceflight. Nobody loses an election, nobody gets fired.”

A2: Orion Solves 6/9

### The plan is popular – retirement has been met with public outcry

Moskowitz, writer, space.com, 6/24/10 (Clara, “Misconceptions swirl around Obama space plan,” http://www.msnbc.msn.com/id/37907917/ns/technology\_and\_science-space/t/misconceptions-swirl-around-obama-space-plan/)

Since its announcement earlier this year, President Barack Obama's new space exploration vision for NASA has met with a firestorm of outcry, confusion and misunderstanding. Some of the most common misconceptions are that the plan would take NASA out of the business of human spaceflight, that the President has introduced an untenable gap in U.S. spacefaring ability, and that NASA's budget has been slashed. There have also been claims that the new plan was a secret political scheme designed by hidden architects behind closed doors. NASA's leaders are trying to set the record straight, and the agency is ultimately hoping that the fervor will die down and people will come to embrace the new direction which aims to send astronauts to visit an asteroid by 2025. "We believe that support for the new plan will grow as people learn more about it," NASA spokesman Mike Cabbage told SPACE.com. [FAQ: NASA's New Direction] Killing the space program? For now, misunderstanding and confusion about the plan remain common. "The new administration didnt come in and kill the space program, but that's what you're hearing a lot," said Leroy Chiao, former NASA astronaut and member of the Augustine committee, a blue-ribbon panel President Obama put together last year to review NASA's plans. In fact, the new proposal for NASA would increase the agency's budget slightly, to $19 billion in 2011, a slight uptick from its 2010 budget of $18.3 billion. Advertise | AdChoicesAdvertise | AdChoices Advertise | AdChoices ."I wouldn't say the new administration is doing anything to shut NASA down," Chiao told SPACE.com. "Overall NASA's getting a slight bump." President Obama also asked for an extra $6 billion over five years to support a new initiative to spur private companies to develop commercial spacecraft capable of ferrying astronauts to and from the International Space Station. That commercial initiative may be partly to blame for the misperception held by some that NASA will stop flying astronauts to space. But it comes on the heels of NASA's space shuttle retirement, which was initially announced in 2004 by former President George W. Bush as part of a then-new vision for space exploration aimed at returning to the moon. The looming gap After the space shuttles retire now potentially in February 2011 America will be left without means to launch people to space. Only two more shuttle missions are currently scheduled after nearly 30 years in service. Under the new plan, NASA would work on designing a heavy-lift rocket to carry humans to an asteroid and on to Mars, while the job of transporting crews to low-Earth orbit would be left to the Russians and the private sector. But this new plan doesn't represent a cease of United States space exploration, said science advocate Bill Nye, known for his role as TV's "Bill Nye the Science Guy," who will soon take up the post of executive director of the Planetary Society, a nonprofit organization devoted to the space exploration. "The idea of the new space policy is to explore new places in space and continue the retiring of the space shuttle, which was started six years ago during the previous administration," Nye said. Yet the looming retirement of NASA's three-orbiter space shuttle fleet has provoked fervent protest from the public, lawmakers and space leaders. Just this week, famed Mercury astronaut John Glenn the first American to orbit the Earth decried the decision to ground the shuttles. "The worlds only heavy lift spacecraft and the U.S.s only access to space should stay in operation until suitably replaced by a new and well tested heavy lift vehicle," Glenn said in a June 17 statement. However, the decision to retire the shuttles is not a new element introduced in the Obama administration plan. "That all this is coming up now is surprising to those of us who thought it was all settled," Nye said.

A2: Orion Solves 7/9

### Obama’s plans are hugely unpopular in congress – renewing the shuttle gains Obama political capital

Khaleej times, 10/3/10 (“Bold new era or death of manned exploration?,” http://www.khaleejtimes.com/Displayarticle08.asp?section=technology&xfile=data/technology/2010/March/technology\_March18.xml.)

The massive cement expanses that dot the flat Florida landscape have been launching pads for history: the first US astronauts blasted into orbit, the Apollo missions to the moon and nearly 30 years of space shuttle flights. But human space travel from Kennedy Space Centre will soon come to a halt. After nearly three decades, the space shuttle programme is set to come to a close in September. The retirement of the shuttle fleet will leave Russian Soyuz capsules as the only means to get humans into orbit - at least until commercial providers can deliver a series of new spacecraft to serve as taxis that NASA will pay to ferry astronauts aloft. The shift comes as part of President Barack Obama’s plans to overhaul the US space programme, scrubbing existing plans to develop a new spacecraft to return humans to the moon. The move amounts to a privatisation of spaceflight, moving away from contractors who simply build spacecraft for the government to contractors that both build and operate them, notes Scott Pace, director of the Space Policy Institute at George Washington University. But Obama’s new space policy, unveiled last month in his 2011 budget proposal, has proven hugely unpopular in Congress, creating a showdown between lawmakers, NASA administrators and the commercial aerospace industry waiting in the wings. ‘I believe this budget and the vision it represents would end our human spaceflight programme as we know it and would surrender at least for our lifetime our leadership in the air,’ said Senator David Vitter, a Republican who is joined by many members of both parties, particularly those with NASA centres in their districts. Critics in Congress decry a loss of US prestige, declining technological progress, the lack of a distinct inspirational goal and a fear that emerging powers like China and India will outpace the US. They also worry about loss of jobs in their districts, with an estimated 7,000 shuttle-related jobs to be lost in and near Kennedy Space Centre alone. ‘This senator fears the US is going to be on the sidelines,’ said Florida’s Bill Nelson, ‘while other countries continue to make incremental progress toward destinations like the moon.’ But top space officials argue there was never enough money to get back to the moon under the existing plan, which NASA administrator Charlie Bolden called ‘living in a hallucination.’ Freed of the routine task of ferrying astronauts to the International Space Station, the US space agency could refocus on new and as yet unspecified missions, he said. Obama’s plan must still be approved by Congress, where the next-generation Constellation spacecraft programme was popular, if underfunded. Members of Congress have expressed ire that they were not consulted, and many say the details of commercial spacecraft are too sketchy and potentially unsafe.

A2: Orion Solves 8/9

### ENDING THE SHUTTLE PROGRAM CAUSES COUNTLESS SKILLED WORKERS TO BE LAID OFF.

Peterson, Patrick. 2011 ")Bracing for impact of shuttle program's end." FlordiaToday.com. FlordiaToday.com, 6/24/2011. Web. <http://www.floridatoday.com/article/20110626/BUSINESS/ 110624024/Bracing-impact-shuttle-program-s-end->.)

As the last shuttle flight approaches, engineers and technicians are considering leaving Brevard County to continue their careers. They will take their college degrees, their skills and their families with them, leaving the Space Coast with less of the talent pool that officials hoped would be a big draw for companies that can help rejuvenate the economy. Though its scope is fluid, this brain drain, as the exodus of skilled workers often is called, seems inevitable. With the next generation of spacecraft stalled in the design stage, any resurgence of aerospace jobs in Brevard will be delayed for several years. Thousands of aerospace workers face finding new careers locally or relocating as part of that quest. Hundreds already have made the move and hundreds more are expected to follow after another 2,000 space workers become unemployed July 22, after the final shuttle mission. This decrease of trained workers diminishes what Brevard leaders have touted as the county’s best asset to attract new industry — an experienced and eager work force. But despite programs for retraining and incentives to encourage companies to hire, the departure of these people likely will continue until new industries take hold. “Not a whole lot can be done about that,” said Frank DiBello, president of Space Florida. Electrical engineer Bobby Cadle took his technical talents to Havelock, N.C., in November. He had worked 22 years at Kennedy Space Center. “I miss my friends and space family at KSC,” said Cadle, 48, who has a master’s degree in electrical engineering and worked on the space shuttle orbiter. After his wife, Catherine, lost her sales job with a Melbourne electronics company, Cadle began job hunting and received a civil service job offer with the Navy in North Carolina. The couple reluctantly decided they’d better leave Brevard. “I would have preferred to stay, but I didn’t want to risk being unemployed,” Cadle said in a phone interview from North Carolina. “I figured that if I stuck around and got laid off, the local job market would be saturated.”

### ENDING THE SHUTTLE PROGRAM LEADS TO MASSIVE LOSS IN JOBS

Atkinson, Nancy. 2008. ("Jobs Eliminated as Shuttle Program Transitions to Constellation." Universe Today. Universe Today, 4/2/2008. Web. <http://www.universetoday.com/13453/jobs-eliminated-as-shuttle-program-transitions-to-constellation/>.)jk

As the space shuttle program winds down and NASA transitions to the new Constellation program, more than 8,000 NASA contractor jobs in the manned space program could be eliminated after 2010, the U.S. space agency said at a press briefing on April 1, 2008. A NASA report sent to Congress predicts that between 5,700 and 6,400 jobs will be lost at the Kennedy Space Center, where the shuttle processing takes place, before 2012. After that time, a few hundred jobs will be added yearly as the new moon-landing program gets started, with the first Constellation launch tentatively scheduled for 2015. Some NASA managers believe that an update to Tuesday’s report, which is due to Congress in six months, won’t be quite so bleak, but NASA said it could be more than a year before it has more dependable job forecasts.

A2: Orion Solves 9/9

### TENS OF THOUSANDS ARE DEPENDENT ON THE SHUTTLE FOR WORK

Neale, Rick. 2011. ("23,000 now expected to lose jobs after shuttle retirement." FlordiaToday.com. FlordiaToday.com, 6/26/2011. Web. <http://www.floridatoday.com/article/20100226/NEWS0204/ 2260321/23-000-now-expected-lose-jobs-after-shuttle-retirement>.)jk

Revised projections now show that about 23,000 workers at and around Kennedy Space Center will lose their jobs because of the shuttles' retirement and the new proposal to cancel the development of new rockets and spacecraft. That sum includes 9,000 "direct" space jobs and -- conservatively speaking -- 14,000 "indirect" jobs at hotels, restaurants, retail stores and others that depend on activity at the space center, said Lisa Rice, Brevard Workforce president. The organization's earlier estimate of 7,000 direct jobs reflected just the retirement of the shuttle program. The updated numbers also include the cancellation of Project Constellation and other initiatives as outlined in the president's 2011 budget, Rice said. "Our unemployment rate is going to skyrocket," she warned Thursday during a five-hour Brevard County Commission space workshop. Much conversation centered on the future of human space launches from KSC, and attendees heaped criticism on Obama's strategy. Mark Nappi is [vice president](http://www.floridatoday.com/article/20100226/NEWS0204/2260321/23-000-now-expected-lose-jobs-after-shuttle-retirement) of launch and recovery systems for United Space Alliance, NASA's prime contractor for shuttle operations. As things stand today, he predicted that more than 4,500 of the company's 5,500 Florida workers will lose their jobs. Geographically speaking, Nappi said 4,850 USA workers live in Brevard, including 3,250 in the northern half of the county.

## A2: State Prize CP 1/2

### No Solvency – NASA leadership key to US leadership

Eric R. Sterner, George C. Marshall Institute, April 2010, “Worthy of a Great Nation? NASA’s Change of Strategic Direction,” George C. Marshall Institute Policy Outlook, http://www.marshall.org/pdf/materials/797.pdf

The United States can only continue to set a global agenda in space by challenging countries to work together in pursuit of a unifying purpose. It took decades after the Apollo program and the stunning loss of seven astronauts aboard the space shuttle Columbia for U.S. policymakers to establish a bipartisan, bicameral consensus on the future of the human exploration program. The fiscal year 2011 budget proposal has already undone that consensus, dividing proponents of a forwardleaning civil space program from advocates of space commercialization, human spaceflight from robotic exploration, and one state from another. In retreating from an exploration program focused on establishing a permanent presence on the moon and reaching Mars within a specific timeframe, the United States will create uncertainty about its plans, leaving others to take the initiative, lay moral claims to a leadership role, and increase their influence in establishing the formal and informal norms that will govern human space exploration for decades. Leadership requires the reverse.

### Prizes fail – don’t spur sufficient investment or innovation.

Thomas Kalil, Special Assistant to the Chancellor for Science and Technology at UC Berkeley, December 2006, “Prizes for Technological Innovation,” http://www.brookings.edu/views/papers/200612kalil.pdf

Prizes have significant limitations. In most circumstances, they should not be the policy instrument of choice for science and technology. Since only winning teams receive prizes, and only after they have won, all entrants must have or raise the funds necessary to compete. Most researchers and small and medium-sized companies find it difficult to self-finance or raise external funding. For example, offering a prize for a breakthrough in high-energy physics would not work if it required physicists to raise billions of dollars to build a new particle accelerator. Furthermore, it may be impossible to clearly specify in advance what the victory conditions are, since the outcomes of fundamental research are, by definition, unknowable or difficult to quantify in advance. Many of the most interesting discoveries in science are serendipitous. Even when the goals of a prize are generally understood, it may be difficult to develop appropriately specific proxies for those goals, such as an improvement in the price-to-performance ratio of a given technology, or widespread market acceptance. Finally, prizes are more likely than traditional funding mechanisms to lead to duplication of effort, although this effect can be mitigated through careful program design (Newell and Wilson 2005).

A2: State Prize CP 2/2

### Prizes aren’t large enough to sustain space exploration – Mars example proves prize would need to be at least $1 billion.

C.A. Carberry, Artemis Westenberg, and Blake Ortner, Executive Director, Explore Mars, Inc., President, Explore Mars, Inc, and Project Leader, ISRU Challenge, Explore Mars, October-November 2010, “The Mars Prize and Private Missions to the Red Planet,” Journal of Cosmology, http://journalofcosmology.com/Mars139.html

Could this concept be applicable to sending humans to Mars? In 2008, X-Prize founder, Peter Diamandis proposed Mega X-prizes including a human mission to Mars. However, in a recent interview, Diamandis stated that it was unlikely there would be a Mega X-Prize geared to a human mission to Mars. "I don't see a Mars Mega-X PRIZE… An incentive prize works when there's a long-term business model and the prize can drive numerous teams to spend the money to play. A private Mars mission is likely a $5B - $10B endeavor and you won't see multiple teams each raising this level…If we ever re-invented launch technology to reduce the cost by 100-fold, then I think a "humans to Mars prize" would make a lot of sense" (Diamandis 2010). While not likely to reduce launch costs by 100-fold, if SpaceX can deliver on its goal of dramatically reducing launch costs, it may bring a Mars mission down to the level where an X-Prize may be viable. In a September 7, 2010 email interview with the first author (Carberry), Elon Musk said he thought a privately financed mission would only cost $2 billion and that a prize would only have to be $1 billion. He added that it would take "ten years from starting fundraising to landing back on Earth." If Musk is correct, not only would hundreds of individuals in the United States alone have the means to fund such a prize, but hundreds would also be able to fund teams to compete.

## A2: China

### China is expanding their space program now

Branigan ’11 (Tania, China correspondent for the Guardian, 4/26/11, “China unveils rival to International Space Station”, http://www.guardian.co.uk/world/2011/apr/26/china-space-station-tiangong)

China laid out plans for its future in space yesterday, unveiling details of an ambitious new space station to be built in orbit within a decade. The project, which one Nasa adviser describes as a "potent political symbol", is the latest phase in China's rapidly developing space programme. It is less than a decade since China put a human into orbit for the first time, and three years since its first spacewalk. The space station will weigh around 60 tonnes and consist of a core module with two laboratory units for experiments, according to the state news agency, Xinhua. Officials have asked the public to suggest names and symbols for the unit and for a cargo spacecraft that will serve it. Professor Jiang Guohua, from the China Astronaut Research and Training Centre, said the facility would be designed to last for around a decade and support three astronauts working on microgravity science, space radiation biology and astronomy. The project heralds a shift in the balance of power among spacefaring nations. In June, the US space agency, Nasa, will mothball its whole fleet of space shuttles, in a move that will leave only the Russians capable of ferrying astronauts to and from the International Space Station. The $100bn (£60.5bn) outpost is itself due to fly only until 2020, but may be granted a reprieve until 2028. Bernardo Patti, head of the space station programme at the European Space Agency (Esa), said: "China is a big country. It is a powerful country, and they are getting richer and richer. They want to establish themselves as key players in the international arena. "They have decided politically that they want to be autonomous, and that is their call. They must have had some political evaluation that suggests this option is better than the others, and I would think autonomy is the key word." He added that China's plans would be "food for thought" for policymakers elsewhere. Esa and other nations are already discussing a next-generation space station that would operate as a base from which to explore space beyond low-Earth orbit; future missions could return astronauts to the moon, land them on asteroids, or venture further afield to Mars. "Another country trying to build its own infrastructure in space is competition, and competition always pushes you to be better," Patti said. The central module of the Chinese space station will be 18.1 metres (59.4ft) long, with a maximum diameter of 4.2 metres and a launch weight of 20 to 22 tonnes. The laboratory modules will be shorter, at 14.4 metres, but will have the same diameter and launch weight. Pang Zhihao, a researcher and deputy editor-in-chief of the magazine Space International, told Xinhua: "The 60-tonne space station is rather small compared with the International Space Station [419 tonnes] and Russia's Mir space station [137 tonnes], which served between 1986 and 2001. "But it is the world's third multi-module space station, which usually demands much more complicated technology than a single-module space lab." China is also developing a cargo spaceship, which will weigh less than 13 tonnes and have a diameter of no more than 3.35 metres, to transport supplies and equipment to the space station. John Logsdon, a Nasa adviser and former director of the Space Policy Institute at George Washington University, said China's plans would give it homegrown expertise in human space flight. "China wants to say: 'We can do everything in space that other major countries can do,'" he said. "A significant, and probably visible, orbital outpost transiting over most of the world would be a potent political symbol." China often chooses poetic names for its space projects, such as Chang'e – after the moon goddess – for its lunar probes; its rocket series, however, is named Long March, in tribute to communist history. The space station project is currently referred to as Tiangong, or "heavenly palace". But Wang Wenbao, director of the China Manned Space Engineering Office, told a news conference: "Considering past achievements and the bright future, we feel the manned space programme should have a more vivid symbol, and that the future space station should carry a resounding and encouraging name. "We now feel that the public should be involved in the names and symbols, as this major project will enhance national prestige and strengthen the national sense of cohesion and pride." China plans to launch the Tiangong-1 module later this year, to help master docking technologies. An unpiloted spacecraft will attempt to dock with the module; two piloted spacecraft will then follow suit. Wang Zhaoyao, spokesman for the programme, said researchers were developing technology to ensure astronauts could remain in space for at least 20 days and to ensure supplies could be delivered safely. According to Space.com, Jiang, the chief engineer at the China Astronaut Research and Training Centre, in Beijing, told an international conference last month: "The <Continued>

<Continued> rendezvous and docking project is smoothly going through technical preparations and testing." The Tiangong-2 should support three astronauts for around 20 days, while the Tiangong-3, which is due for launch in 2015, should support them for twice as long. The laboratories would allow China to develop the technology it needs to build the space station. Jiang added that China aimed to increase international exchanges, and that the hardware from the current rendezvous and docking project is compatible with the International Space Station. "We will adhere to the policy of opening up to the outside world," he said. "Scientists of all countries are welcome to participate in space science experimental research on China's space station." China hopes to make its first moon landing within two years and to put an astronaut on the moon as early as 2025.

# NEG:

## 1NC Frontline 1/2

### US space shuttles not key to the ISS

Klotz ’11 (Irene, Space reporter and columnist for Reuters,

The United States is retiring its three space shuttles due to high operating costs and to free up funds to develop new spaceships that can carry astronauts beyond the station's 220-mile high orbit where the shuttles cannot go. "Once the space shuttle retires we're going to lose a lot of capability of moving large payloads out in space, but then that opens the doors for new things that are going to come across the horizon," said Endeavour's pilot, Greg Johnson. The primary goal of Endeavour's flight, the 134th for NASA's space shuttle program, was to deliver and install the $2 billion Alpha Magnetic Spectrometer particle detector, designed to study dark matter, antimatter and other high-energy phenomena that cannot be detected by telescopes. That job was accomplished shortly after Endeavour's May 18 arrival at the $100 billion space station, a project of 16 nations that has been under construction since 1998. Atlantis will be delivering a year's worth of supplies to the station. NASA is turning over U.S. cargo runs to two companies, Space Exploration Technologies and Orbital Sciences Corp., and hopes commercial flights will be available to ferry station crew members as well within four or five years. In the interim, Russia will provide space taxi services, at a cost of more than $50 million a seat. Russia, Europe and Japan also fly cargo ships.

### US Shuttles not key to ISS – Russia is reliable, and the U.S. is still in charge of the ISS.

Koch ’10 (Tom, reporter for 13 Eyewitness News, 11/5/10, “What does end of space shuttle program mean to US?”, http://abclocal.go.com/ktrk/story?section=news/technology&id=7766055)

"I’m not sure so many Americans actually know that we're not going to have a human space flight program for a while," shuttle commander Mark Kelly said. Kelly was there to watch his twin brother, Scott, launch on the Soyuz to the International Space Station. He admits relying on Russia is not an ideal situation but one that's been in the plan for a long time. "But the good news is we're gonna continue, we're gonna build something new, and we'll be flying again here in hopefully five or six years," Kelly said. NASA officials point out America has been relying on Russia for years, launching many astronauts on board the Soyuz. And they say America will still lead the International Space Station. "It's a misnomer to say that we're not a leader in space," said Bill Gerstenmaier, NASA's associate administrator. "We still are leading in space; we're doing it a different way." "When the shuttle goes away, we're not gonna be the lead on transportation, but we're the lead across the board on many other things," Joel Montablano, NASA's Russia manager, said. "Together we make it happen; no one country can do this."

1NC Frontline 2/2

### Effects of microgravity doesn’t prevent colonization/ AT: Colonization impossible - microgravity

Robert Zubrin, Ph.D., astronautical engineer, President of the Mars Society, October-November 2010, “Human Mars Exploration: The Time Is Now,” Journal of Cosmology, http://journalofcosmology.com/Mars111.html

4.2. Zero Gravity: Cosmonauts have experienced marked physiological deterioration after extended exposure to zero gravity. However a Mars mission can be flown employing artificial gravity generated by rotating the spacecraft. The engineering challenges associated with designing either rigid or tethered artificial gravity systems are modest, and make the entire issue of zero-gravity health effects on interplanetary missions moot. Preventive measures solve gravity problems. Bethany Ehlmann et al, Department of Earth and Planetary Sciences, Washington University, St. Louis, May/June 2005, “Humans to Mars: A feasibility and cost–benefit analysis,” Acta Astronautica, p.856 In the course of a human mission to Mars, the crew will experience the zero-gravity environment of interplanetary space, the 0.38g environment of Mars, the zero gravity of space on the return trip, and a return to normal Earth gravity. Research on microgravity effects has been conducted using space-based data as well as ground-based simulations like water immersion. Pharmaceuticals, exercise, conditioning, and artificial gravity are promising strategies that mitigate the effects of microgravity on humans in space. Exercise and conditioning are considered effective means of countering the physiological effects of microgravity, though the amount of time devoted to an exercise program must be weighed against time taken away from required dailytasks and functions.

### New space missions trade off within the NASA budget – tanks solvency.

Norman R. Augustine et al, chairman of the Aeronautics Committee of the NASA Advisory Council and served on the Air Force Scientific Advisory Board, 2009, “Seeking a Human Spaceflight Program Worthy of a Great Nation,” http://legislative.nasa.gov/396093main\_HSF\_Cmte\_FinalReport.pdf

In the case of NASA, one result of this dilemma is that in order to pursue major new programs, existing programs have had to be terminated, sometimes prematurely. Thus, the demise of the Space Shuttle and the birth of “the gap.” Unless recognized and dealt with, this pattern will continue. When the ISS is eventually retired, will NASA have the capability to pursue exploration beyond low-Earth orbit, or will there be still another gap? When a human-rated heavy-lift vehicle is ready, will lunar systems be available? This is the fundamental conundrum of the NASA budget. Continuation of the prevailing program execution practices (i.e., high fixed cost and high overhead), together with flat budgets, virtually guarantees the creation of additional new gaps in the years ahead. Programs need to be planned, budgeted and executed so that development and operations can proceed in a phased, somewhat overlapping manner.

### Colonization can’t happen – health concerns and costs are overwhelming.

Dirk Schulze-Makuch, Earth and Environmental Sciences, Washington State, and Paul Davies, Beyond Center, Arizona State, 2010. “To Boldly Go: A One-Way Human Mission to Mars.” Journal of Cosmology 12 (October-November): 3619–3626, http://journalofcosmology.com/Mars108.html

The exploration of Mars has been a priority for the space programs of several nations for decades, yet the prospect of a manned expedition continually recedes in the face of daunting and well-recognized challenges. The long travel time to Mars in zero gravity and high radiation conditions would impose a serious health burden on the astronauts. The costs of developing the launch vehicle and assembling the large amount of equipment needed for the astronauts to survive the journey and their long sojourn on the Martian surface, together with a need to send all the fuel and supplies for a return journey make a manned Mars expedition at least an order of magnitude more expensive than the Apollo program.