## 1AC

### Inherency

**Contention one is inherency.**

**Current UAVs are inefficient and dangerous, only solar powered UAVs solves**

**Bhatt 12** (Manish R., May, 2012, “Solar Power Un~~manned~~ Aerial Vehicle: High Altitude Long Endurance Applications (HALE-SPUAV),” <http://www.engr.sjsu.edu/~nikos/MSAE/pdf/Bhatt.S12.pdf>)

Today there are more than 11,000 UAVs in service (or planned service) by the United States Military for various purposes. Although these UAVs provide tremendous benefits, they fall short on performance due to their power restrictions; they must either land to be recharged or land for another UAV to complete the mission. By having the UAV returning every two (2) hours for recharge can be extremely costly or dangerous for the war fighter, if used on the battlefield [1].¶ Increasing battery sizes or the number of batteries, due to the weight restrictions, cannot solve these problems; weight is proportional to the endurance ¶ of the UAV. With the implementation of solar cells, the UAV would be able to collect and store solar energy to be used for night time flight, and thus having no return to recharge (R/R) requirement. Again efficiency would play a drastic role; all the critical sub-systems must be lightweight and efficient enough to support the total weight of the UAV. ¶ Without an R/R requirement a war fighter can always depend on the UAV being able to scan a perimeter prior to entry. Currently, the U.S. military has been looking for a long endurance low cost surveillance aircraft, similar to this mission (as defined in Section 3.0) [2]. This design may not only be used for military purposes, but weather surveillance, and even commercial use.

**DARPA recently canceled Boeing contract to develop solar powered UAVs**

**Host 5/12** (Pat, May 15, 2012, “DARPA Restructures Boeing's Solar UAV Contract, Won't Launch By 2014,” Defense Daily, lexis)

Boeing [BA] said yesterday the Defense Advanced Research Projects Agency (DARPA) restructured its 2010 contract to build a solar-powered un~~manned~~ aerial vehicle (UAV) flight demonstrator over technology maturation concerns.¶ Boeing was awarded an $89 million contract in 2010 to develop and fly a solar-powered UAV flight demonstrator, called SolarEagle, by 2014 as part of the Vulture II demonstration program, according to a statement. Boeing spokeswoman Deborah Van Nierop told Defense Daily yesterday the company and DARPA discussed what to do with the ScanEagle demonstrator one month ago and decided Boeing needed to focus on solar collection and energy subsystems, including solid fuel cells, over the remainder of the contract.¶ "(We) won't build one in the near term," Van Nierop said. "Certainly not until we mature the necessary technology."¶ Van Nierop said Boeing has no estimated date for when the ScanEagle demonstrator may make its debut.¶ DARPA said in a statement on its website the solar collection and fuel cells technologies are vital for enabling ultra-persistent, high-altitude and long-endurance (HALE) flights lasting multiple years.¶ "By narrowing the program's focus, DARPA seeks to advance energy management technologies that would benefit a number of future HALE aircraft applications and should reduce risk for development of future very long-endurance aircraft programs," DARPA said in a statement.¶ In a 2010 statement, Boeing touted the ScanEagle demonstrator as remaining in the upper atmosphere for 30 days by harvesting solar energy during the day that would be stored in fuel cells and used to provide power during the night. The ScanEagle demonstrator would also have highly-efficient electric motors and propellers and a high-aspect-ratio, 400-foot wing for increased solar power and aerodynamic performance, according to a statement.¶ Pat O'Neil, Boeing Phantom Works program manager for Vulture II, said in a 2010 statement the ScanEagle's eventual goal is to remain "on station" at stratospheric altitudes for at least five years.

### Plan

**The United States Department of Defense should provide a direct grant for the installation of solar panels on unstaffed aerial vehicles.**

### Adv 1

**Advantage one is hegemony.**

**There’s a massive military buildup in Asia threatening US hegemony**

**The Economist 3/26** (March 26, 2012, “Asia Is Undergoing The Fastest Military Buildup On The Planet,” Business Insider, http://articles.businessinsider.com/2012-03-26/news/31238553\_1\_military-spending-singapore-aceh)

According to a report from the Stockholm International Peace Research Institute (SIPRI), Singapore is now the fifth-largest arms importer in the world, bested only by some obvious behemoths--China, India and Pakistan--plus South Korea. Singapore accounts for 4% of the world's total spending on arms imports. Its defence spending per head beats every country bar America, Israel and Kuwait. This year $9.7 billion, or 24% of the national budget, will go on defence.¶ These are striking figures, but then Singapore has been one of the bigger spenders in the region since its rancorous split from Malaysia in 1965. The difference now is that almost every country in South-East Asia has embarked on a similar build-up, making it one of the fastest-growing regions for defence spending in the world. Military analysts at IHS Jane's say that South-East Asian countries together increased defence spending by 13.5% last year, to $24.5 billion. The figure is projected to rise to $40 billion by 2016. According to SIPRI, arms deliveries to Malaysia jumped eightfold in 2005-09, compared with the previous five years. Indonesia's spending grew by 84% in that period.¶ It is part of a wider Asian phenomenon. For the first time, in modern history at least, Asia's military spending is poised to overtake Europe's, according to the International Institute for Strategic Studies, a think-tank in London. China is doubling its defence budget every five years and India has just announced a 17% rise in spending this year, to about $40 billion.¶ Until recently domestic insurgencies have amply justified some South-East Asian countries' defence spending. Yet for decades there have been no interstate conflicts. An existential angst remains in Singapore over Malaysia to the north and Indonesia, its big neighbor to the south. Still, it is hard to imagine any of the Association of South-East Asian Nations (ASEAN) locking horns, apart perhaps from Cambodia and Thailand, who lob the occasional artillery shell at each other over a disputed temple on the border.¶ Mostly, though, countries seem to be exploiting economic success to update their hardware while the going is good. Defence spending slowed sharply after the Asian financial crisis in 1997-98, when many planes and ships were already old. Now many countries are enjoying rapid economic growth, of up to 6% a year, and robust budgets. This is not, says Bill Edgar of IHS Jane's, a "strategic" arms race. Rather, he says, it is all about modernization.¶ Take the regional giant, Indonesia. The Indian Ocean tsunami of 2004 not only devastated communities, it also laid bare the shortcomings of the armed forces, which proved to be ill-equipped and demoralized. As American and Australian troops poured off aircraft carriers and other ships into the ravaged province of Aceh to bring aid and search for victims, Indonesian troops were reduced to spectators. The newly elected president, Susilo Bambang Yudhoyono, took the humiliation personally. A former general, Mr Yudhoyono has since made modernizing Indonesia's armed forces a priority.¶ Indonesia is spending $8 billion this year on defence--still rather modest for a country of 240m, but up sharply from $2.6 billion in 2006. Much is going on new hardware and spare parts. The country has acquired Russian and American warplanes, including F-16 fighters, vessels for its navy, and spare parts for its C-130 transport planes. In January Indonesia signed a $1.1 billion deal for three German-made diesel-electric submarines, and lawmakers are debating whether to buy 100 Leopard tanks from the Netherlands. Mr Yudhoyono also wants to improve the lot of soldiers, with higher salaries and benefits.

**Specifically, China is challenging heg**

**Marvin 6/8** (Taylor, June 8, 2012, “PRC Area-Denial Capabilities and American Power Projection, Part 1” Prospect Journal, <http://prospectjournal.ucsd.edu/blog/index.php/prc-area-denial-capabilities-and-american-power-projection-part-1/>)

China’s rapid economic growth heralds the first rival in the position to challenge US military hegemony on a near-peer basis since the end of the Cold War.[1] While the United States currently spends a much larger portion of its GDP on defense, China’s military expenditures are rapidly increasing and are forecast to possibly surpass the United States’ by 2035.[2] Of course, military spending does not directly translate into military capabilities, and the People’s Liberation Army (PLA) lags far behind US and allied forces in equipment, training, and the competence and officer corps experience. However, despite this capability gap China’s rapidly modernizing forces are the greatest conventional challenge to face the US military since the dissolution of the USSR.

**The US is planning on increasing military presence in China now, means China will inevitably The US is planning on increasing military presence in China now, means China will inevitably backlash**

**Glaser 8/9** (John, August 9, 2012, “US Deploying Surveillance Drones Near China,” <http://news.antiwar.com/2012/08/09/us-deploying-surveillance-drones-near-china/>)

“Stealthy American bombers and submarines would knock out China’s long-range surveillance radar and precision missile systems located deep inside the country,” reports theWashington Post. ”The initial ‘blinding campaign’ would be followed by a larger air and naval assault.”¶ The Obama administration has been ramping up the pressure on China with an increasingly antagonistic foreign policy. The so-called ‘Asia pivot’ is an aggressive policy that involves surging American military presence throughout the region – in the Philippines, Japan, Australia, Guam, South Korea, Singapore, etc. – in an unprovoked scheme to contain rising Chinese economic and military influence.¶ Chinese officials have not appreciated this unprovoked bellicosity. In May the Chinese Defense Ministry accused the Pentagon of hyping a Chinese military threat out of thin air. Others have said these Pentagon moves could start an arms race.¶ “If the U.S. military develops Air-Sea Battle to deal with the [People’s Liberation Army], the PLA will be forced to develop anti-Air-Sea Battle,” one officer, Col. Gaoyue Fan, said last year in a debate sponsored by the Center for Strategic and International Studies, a defense think tank.¶ A recent report from the Center for Strategic International Studies predicted that next year “could see a shift in Chinese foreign policy based on the new leadership’s judgment that it must respond to a US strategy that seeks to prevent China’s reemergence as a great power.”¶ “Signs of a potential harsh reaction are already detectable,” the report said. “The US Asia pivot has triggered an outpouring of anti-American sentiment in China that will increase pressure on China’s incoming leadership to stand up to the United States. Nationalistic voices are calling for military countermeasures to the bolstering of America’s military posture in the region and the new US defense strategic guidelines.”

**Strong surveillance and reconnaissance key to monitor China and contain threats**

**Greene 10** – MA in Security Studies from Georgetown University (Jordan Lee, April 19, 2010, “An Assessment of the US-Chinese Reconnaissance-Strike Competition,” <https://repository.library.georgetown.edu/bitstream/handle/10822/553503/greeneJordan.pdf?sequence=1>)

Increasing surveillance and reconnaissance key to contain China aggression¶This section identifies the factors that will determine the long-term direction of the ¶ reconnaissance-strike competition. It accomplishes this by:¶  Specifying which reconnaissance-strike skills are critical to the United States and China;¶  Assessing which skill is most fundamental to the reconnaissance-strike mission of each ¶ military, and whether elements of that skill are generalizeable; and¶  Identifying key variables that determine the efficacy with which each side is able to ¶ execute its primary reconnaissance-strike skill.¶ Although this section’s analysis may partly illuminate the current state of the competition, ¶ that is not its purpose. Its intent is to enable generalizations on military investment in Section IV.¶ A. Assessing Critical Skills¶ In the Pacific theater, there are two primary skills that the U.S. RUK must be able to accomplish: ¶ suppression of enemy air defenses (SEAD) and the destruction of mobile missile launchers. ¶ Table 9 provides a snapshot of these skills, along with three critical Chinese reconnaissance strike skills. The two U.S. skills are quite similar: both require finding and tracking mobile ¶ targets that are behind enemy lines—often deep behind enemy lines.¶ Of the two, the former is more important. Since World War I, the United States has never ¶ won a major campaign without first establishing air superiority. If able to successfully execute ¶ SEAD, the United States will be able to penetrate Chinese airspace with less survivable assets, ¶ maximizing downrange weapons density and hastening destruction of China’s mobile missile ¶ launchers.

**We solve through 2 internal links:**

1. **Battlefield strength**

**Aff key to solve reconnaissance, surveillance, and military communications**

**Rui et al 11** (Wang, Zhu Xiaoping, Zhou Zhou, “Design Gust Alleviation Controller for Highly Flexible Solar UAV,” 2011 Third International Conference on Measuring Technology and Mechatronics Automation, <http://ieeexplore.ieee.org.proxy.lib.umich.edu/stamp/stamp.jsp?tp=&arnumber=5720936>)

Compared with the usual aircraft, solar-powered UAVs are not being constrained by its energy, and the endurance is few days or even months, it is particularly suitable for the ultra-long reconnaissance, surveillance and communications relay missions. Solar-powered UAV has become one of the important Parts of the development of HALE UAV.¶ The aspect ratio of the solar-powered HALE UAV is large and its density of structures is small, so its structure is highly flexible, as a result, the elastic oscillation of the wing is obvious and the flight security is influence seriously. At the same time, as the natural frequency of the wing is very low, it will couple with the flight dynamics response and changing the dynamic response characteristics of UAV [1]. The mishap analysis report of the U.S “Helios” in 2003 shown that, the main reason of the mishap is the continued large dihedral angle and the following instability caused by gust [2], and some improved methods in technologies are proposed too, such as developing more advanced multidisciplinary “Time Domain” analysis methods and tools for the highly flexible “morphing” aircraft, and the wing dihedral angle should be controlled manually or automatically in flight [3].

Improved targeting and efficiency

Chin 11 (Chee Keen, March 2011, “Extending the Endurance, Missions and Capabilities of Most UAVs Using Advanced Flexible/Ridged Solar Cells and New High Power Density Batteries Technology,” <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA543922>)

The improvement of flight endurance will greatly benefit military units that use mini-UAVs for RSTA and BDA missions. First, the extended on-site mission time will allow a mini-UAV to monitor the targets-of-interest and their movement without losing contact. Next, the number of UAV takeoffs and landings will be reduced; hence, minimizing the risk of damaging the mini-UAV. This translates to lower operational cost and shorter operational turn-around time. Damage is reduced mainly because the flexible photovoltaic cells do not break easily during the hard landing associated with mini-UAV recovery, as compared to brittle rigid cells. Last, the other spare aircraft wing covered with TFPV cells can be used to charge up any small electronic handheld equipment or the exhausted mini-UAV’s battery after flight.

**Adaptation to austere environments to fight effectively**

**Kuntz**, **07** (Gordon D. is Fellow at the United States Army War College with the Fellowship at the Army Environmental Policy Institute, UNITED STATES ARMY WAR COLLEGE CIVILIAN RESEARCH PROJECT, “USE OF RENEWABLE ENERGY IN CONTINGENCY OPERATIONS,” April, [www.aepi.army.mil/internet/use-of-renew-en-conting-ops.pdf](http://www.aepi.army.mil/internet/use-of-renew-en-conting-ops.pdf))

Having dependable, secure energy is a national security issue. The United States Army will always require energy as a **key resource** to accomplish its mission. Some may believe in an underlying false perception of the United States having an endless supply of energy no matter where we live, operate, or fight. This may be attributed to the continued growth in oil use. Yet, as national and international conflicts continue around the world and the United States becomes involved in these conflicts - whether peace keeping, conducting stability operations, nation building, or providing humanitarian aid13 - the United States Army can expect to operate in austere environments with little host nation infrastructure to support the mission and quite possibly little host nation governmental support or governmental involvement. In the 2006 State of the Union Address, the President identified other areas of the world that required freedom, justice, and peace naming Syria, Burma, and Zimbabwe14. If the United States were to become involved with efforts to provide the freedom, justice and peace identified in the address, the austere environments of these countries, limited host nation infrastructure, and projected remoteness of operations will have a definite and dramatic impact on operations, especially logistic support. Given the United States imported approximately 2 millions barrels of oil daily from three African countries (Nigeria, Algeria, and Angola) in September 2006, as seen in Table 2, the strategic importance of Africa is clear. Furthermore, by September 200815 the Pentagon plans to stand up a regional command dedicated to the entire African continent in which Africa will fall under one command instead of its current organization of three regional commands (European Command, Central Command, and Pacific Command) reinforcing Africa’s strategic importance16. Also of consideration are the ever increasing presence of Islamic extremists in Somalia and the spread of Islam in other African countries. It is unclear how this dynamic will or could impact oil exports from Africa to the United States. If African based United States Embassies were again threatened or attacked as they were in 1998 by Al Qaeda, or relationships between African countries spoil due to pressure or unrest from various factions or governments in Africa17, continued genocide, human rights violations, state sponsored terrorism, political concerns, or extreme alteration of economic or social situations from extreme famine, African oil imports to the United States could be threatened. The same scenario can present in other regions of the world where oil is exported to the United States, including South America, potentially compromising the oil available for the United States to import. The continued perceptions and thinking of “doing things like we have always done” pertaining to the endless supply and re-supply of fuel and energy is fatalistic thinking. The Chinese Philosopher Lao-tse stated: In managing affairs there is no better advice than to be sparing. To be sparing is to forestall. To forestall is to be prepared and strengthened. To be prepared and strengthened is to be ever successful. To be ever successful is to have infinite capacity. Chinese Philosopher Lao-tse, two and a half millennia ago. (In Tao Te Ching 59)18 Only when the United States is significantly less dependent on foreign oil can it explore the full extent of its capacity. Implications for the Army Commanders19 must explore alternative means of energy that not only diminish the continued need for fossil based fuels but also energy that allows for maintaining current operational systems during high level conflict without degrading the mission. Viet-Nam, Somalia, Afghanistan, and Iraq have demonstrated that guerrilla warfare is an effective means of resisting a well equipped force. It is highly unlikely that future battles or battlefields will have huge armies squared off force on force as in WWI and WWII. Future conflicts or engagements will most likely occur in impoverished countries with minimal or very limited infrastructure, making traditional military operations challenging. Asymmetrical, irregular warfare with engagements taking place in urban 7 areas, rural settings, or on inhospitable terrain will make maneuvering and re-supply extremely difficult. Commanders must examine all aspects of military operations, exploring potential renewable sources of power (photovoltaic, wind, hydro, and/or biomass) for base operations and power source(s) to run generators for maintenance of communications, health and welfare needs, and so forth.

**Versatility, deployability, lethality, and expansibility are key to power projections**

Gunzinger, senior advisor to the Air Force, 2011 (Mark A., “Power Projection: Making the Tough Choices,” School of Advanced Airpower Studies, Air University, United States Air Force, <http://aupress.au.af.mil/digital/pdf/paper/t_gunzinger_power_projection.pdf>)

The US Army places a high priority on developing its power projection capability. ¶ AirLand Operations states: "The fundamental mission of the Army is achieving deterrence ¶ through demonstrating a credible capability to project overwhelming combat.¶ To achieve its ¶ mission, the future Army must be versatile, deployable, lethal, and expansible. Versatility ¶ describes the ability to tailor forces as necessary to meet a wide array of threats. Deployability is ¶ a combination of interoperability and ability to rapidly deploy globally. Lethality is the capability ¶ to quickly defeat an opponent while sustaining a minimum of casualties, while expansibility ¶ describes the total-force concept of expanding the active component with reserve forces. ¶ According to AirLand Operations, these four characteristics are absolutely essential to the future ¶ strategic Army.

1. **Readiness**
2. **Energy reliability**

**Frequent power outages means we need sustainable energy to power drones**

**Roberts 7/31** (David, July 31, 2012, “Why the military is trying to reduce its fossil fuel use,” Grist, <http://grist.org/climate-energy/why-the-military-is-trying-to-reduce-its-fossil-fuel-use/>)

In 2008, the Defense Science Board Task Force on Department of Defense Energy Strategy released its findings in a seminal report called “More Fight — Less Fuel.” Here, from a slideshow summary [PDF] of the report, are the “two primary energy risks to DoD.”¶ Unnecessarily high and growing operational fuel demand increases mission risk¶ Critical missions at fixed installations are at unacceptable risk from extended power loss¶ So: too much liquid fuel needed in the field and too much reliance on unsteady power grids at the bases.¶ Let’s turn to recent news.¶ First, a couple weeks ago, “a bomb planted by the Taliban in northern Afghanistan destroyed 22 NATO fuel tankers carrying supplies to coalition forces.” Luckily the bomb went off fairly early in the morning, so there weren’t many casualties to add to the more than 3,000 Americans killed protecting fuel convoys in Iraq and Afghanistan. This is all it took: “the device was attached under one of the trucks, which were parked close together.”¶ As I wrote in Outside last year:¶ THE TACTICAL NEED to reduce reliance on fossil fuels is not new to the Pentagon. In 2003, at the outset of the second Iraq war, General James Mattis commanded the 1st Marine Division during the initial drive to Baghdad. He found himself repeatedly outrunning his own fuel resupply lines, forcing him to slow down to remain fully powered. In a post-combat report that has since become a touchstone for military analysts, he called on the Department of Defense to “unleash us from the tether of fuel.”¶ Mattis’s plea served to highlight the extraordinary costs of fuel to the military in Afghanistan and Iraq—in dollars and lives. By some estimates, fully 70 percent of the convoys crisscrossing the theater of war are involved in “liquid logistics,” the delivery of fuel and water. In Afghanistan, fuel reaches the front lines via tankers and planes that cross the ocean, trucks from Tajikistan or Russia, and (sometimes) helicopters from forward bases. By the time it gets there, the fully burdened cost can reach anywhere from $30 to an astounding $400 per gallon. Then there are the casualties: one for every 24 fuel convoys, according to a 2009 report by the Army Environmental Policy Institute.¶ Reducing fuel use in the field is about saving lives, pure and simple.¶ Second, recent research has shown that power outages are becoming more common in the U.S. In 2008, “there were 2,169 power outages in the U.S. affecting 25 million people. In 2011, there were more than 3,000 outages affecting 41.8 million people.” Absent enormous investments in the grid, this trend is expected to continue as power lines get older and weather gets weirder. Meanwhile, there are 64 bases in the U.S. that operate drones by remote control. A power outage at a base during a drone mission would be … awkward.¶ And it’s not just U.S. bases that need to learn how to generate their own power and handle their own (micro)grids. The U.S. is building drone bases all over the world, often in places with even worse grids than ours. A blackout just yesterday in India left 300 million people in the dark. Autonomous power generation will become more and more mission critical.

**Energy sustainability key to readiness**

Diamond, 11 [August, Think Progress, [Military Invests Heavily In Clean Energy As Study Finds It Saves Lives](http://thinkprogress.org/security/2011/08/17/298256/military-invests-heavily-in-clean-energy-as-study-finds-it-saves-lives/), <http://thinkprogress.org/security/2011/08/17/298256/military-invests-heavily-in-clean-energy-as-study-finds-it-saves-lives/>]

Renewable energy [reduces military casualties](http://money.cnn.com/2011/08/17/technology/military_energy/) and leads to a more effective fighting force. Those findings from an Army study are a big part of the reason the U.S. military is increasingly moving away from oil and investing heavily in clean energy. From 2003 to 2007, an astounding [one out of eight U.S. Army casualties](http://money.cnn.com/2011/08/17/technology/military_energy/) in Iraq was the result of protecting fuel convoys. That’s a total of [3,000 troops](http://money.cnn.com/technology/storysupplement/cost_military_oil_addiction/?iid=EL) who died trying to transport oil:¶ From experimental solar-powered desert bases for the Marines to Navy robots that run on wave energy, the military is quickly becoming a leading buyer of cutting-edge renewable energy technology.¶ For the armed services, the benefits extend beyond reducing fuel convoy casualties. A fighting force that isn’t restricted by the reach of a tanker truck or weighted down by heavy batteries is more nimble and, as a result, more lethal.

1. Stealth

Renewable energy powered drones essential to increasing unit stealth and limiting enemy intel on troop positions

Kuntz, 2007 (Gordon D. is Fellow at the United States Army War College with the Fellowship at the Army Environmental Policy Institute**, UNITED STATES ARMY WAR COLLEGE CIVILIAN RESEARCH PROJECT, “USE OF RENEWABLE ENERGY IN CONTINGENCY OPERATIONS,” April,** [www.aepi.army.mil/internet/use-of-renew-en-conting-ops.pdf](http://www.aepi.army.mil/internet/use-of-renew-en-conting-ops.pdf)

Use of renewable energy systems during CONOPS has multiple and varied advantages for Commanders. Advantages include36: power by up to 30%, a decrease in maintenance needs, and overall reduction in cost from fuel savings both in decreased fuel use and cost of hauling fuel. Further benefits occur in reduction in the size and weight of noisy, fuel consuming power units, reduction of weight requirements for military operations through use of lighter equipment, and increased security through reduction of thermal image, improved stealth with reduced noise, and greater control of intelligence through decreased waste. By decreasing waste there is a significant restriction on potential enemy information gathering efforts through removal of a readily accessible source of material found in landfills. Biomass generators and MISER waste to energy systems give a reduction of water requirements of up to 50-80% and significantly decrease or eliminate transportation needs for waste disposal.

Stealth is critical to military flexibility and readiness
Davis, 1 (Paul K., research leader for defense and force transformation planning at RAND, March, Transforming the Armed Forces: An Agenda for Change, [**http://www.ndu.edu/inss/books/Books\_2001/Global%20Century%20-%20June%202001/C19Davis.pdf**](http://www.ndu.edu/inss/books/Books_2001/Global%20Century%20-%20June%202001/C19Davis.pdf)**)**

Necessity**. In the longer term, many nations’ forces will use aspects of the new technology. Indeed, much of the requisite technology is or will be commercially available.** As a result, traditional forces will no longer be viable. For example, **forces will need to disperse substantially because of the extreme vulnerability of fixed targets**. For related reasons, **they will need to maneuver over longer distances, to maneuver much more quickly and with much less physical concentration of forces themselves, and to operate with greatly reduced logistical footprints. In addition, they will need to defend themselves from a variety of missiles, including those carrying weapons of mass destruction (WMD**). In the longer run, it is not clear how the measure- countermeasure race will play out. **Aircraft and ships will become more stealthy, but remotely piloted aircraft and space-based surveillance will improve, as will missiles to attack those aircraft and ships**. Active defenses will improve, but may be overcome by sheer numbers. New forms of active defenses, such as beam weapons, will perhaps be less prone to saturation. The war in cyberspace will likely be increasingly important. There is no end in sight to the changes that may occur. Implications: Change Is Required. With this combination of near-term opportunity and daunting, longer term challenges, **there should be little question about the need for major changes. Many of those changes will be inexorable consequences of the same information technology that has transformed modern business practices and day-to-day life**. Others will be more uniquely related to the increased precision of weapons, superb navigation, WMD systems, and information warfare

**Readiness is key to hege**

Jack **Spencer**, Policy Analyst at Heritage, **2k**, Heritage Foundation Reports, Lexis

The evidence indicates that the U.S. armed forces are not ready to support America's national security requirements. Moreover, regarding the broader capability to defeat groups of enemies, military readiness has been declining. The National Security Strategy, the U.S. official statement of national security objectives, 3 concludes that the United States "must have the capability to deter and, if deterrence fails, defeat large-scale, cross-border aggression in two distant theaters in overlapping time frames." 4 According to some of the military's highest-ranking officials, however, the United States cannot achieve this goal. Commandant of the Marine Corps General James Jones, former Chief of Naval Operations Admiral Jay Johnson, and Air Force Chief of Staff General Michael Ryan have all expressed serious concerns about their respective services' ability to carry out a two major theater war strategy. 5 Recently retired Generals Anthony Zinni of the U.S. Marine Corps and George Joulwan of the U.S. Army have even questioned America's ability to conduct one major theater war the size of the 1991 Gulf War. Military readiness is vital because declines in America's military readiness signal to the rest of the world that the United States is not prepared to defend its interests. Therefore, potentially hostile nations will be more likely to lash out against American allies and interests, inevitably leading to U.S. involvement in combat. A high state of military readiness is more likely to deter potentially hostile nations from acting aggressively in regions of vital national interest, thereby preserving peace.

**Hegemony key to prevent great power nuclear wars
Zhang and Shi, 2011** (Yuhan, Researcher at the Carnegie Endowment for International Peace, America’s Decline: A Harbinger of Conflict and Rivalry, January 22, <http://www.eastasiaforum.org/2011/01/22/americas-decline-a-harbinger-of-conflict-and-rivalry/>)

This does not necessarily mean that the US is in systemic decline, but it encompasses a trend that appears to be negative and perhaps alarming. Although the US still possesses incomparable military prowess and its economy remains the world’s largest, the once seemingly indomitable chasm that separated America from anyone else is narrowing. Thus, [the global distribution of power is shifting](http://www.eastasiaforum.org/2010/09/13/china-and-the-challenge-to-american-power-weekly-editorial/), and the inevitable result will be a world that is less peaceful, liberal and prosperous, burdened by a dearth of effective conflict regulation. Over the past two decades, no other state has had the ability to seriously challenge the US military. Under these circumstances, motivated by both opportunity and fear, many actors have bandwagoned with US hegemony and accepted a subordinate role. Canada, most of Western Europe, India, Japan, South Korea, Australia, Singapore and the Philippines have all joined the US, creating a status quo that has tended to mute great power conflicts. However, [as the hegemony that drew these powers together withers](http://www.cfr.org/publication/23537/belttightening_for_us_foreign_policy.html), so will the pulling power behind the US alliance. The result will be an international order where power is more diffuse, American interests and influence can be more readily challenged, and conflicts or wars may be harder to avoid. As history attests, power decline and redistribution result in military confrontation. For example, in the late 19th century America’s emergence as a regional power saw it launch its first overseas war of conquest towards Spain. By the turn of the 20th century, accompanying the increase in US power and waning of British power, the American Navy had begun to challenge the notion that Britain ‘rules the waves.’ Such a notion would eventually see the US attain the status of sole guardians of the Western Hemisphere’s security to become the order-creating Leviathan shaping the international system with democracy and rule of law. Defining this US-centred system are three key characteristics: enforcement of property rights, constraints on the actions of powerful individuals and groups and some degree of equal opportunities for broad segments of society. As a result of such political stability, free markets, liberal trade and flexible financial mechanisms have appeared. And, with this, many countries have sought opportunities to enter this system, proliferating stable and cooperative relations. However, what will happen to these advances as America’s influence declines? Given that America’s authority, although sullied at times, has benefited people across much of Latin America, Central and Eastern Europe, the Balkans, as well as parts of Africa and, quite extensively, Asia, the answer to this question could affect global society in a profoundly detrimental way. Public imagination and academia have anticipated that a post-hegemonic world would return to the problems of the 1930s: regional blocs, trade conflicts and strategic rivalry. Furthermore, multilateral institutions such as the IMF, the World Bank or the WTO might give way to regional organisations. For example, Europe and East Asia would each step forward to fill the vacuum left by Washington’s withering leadership to pursue their own visions of regional political and economic orders. Free markets would become more politicised — and, well, less free — and major powers would compete for supremacy. Additionally, such power plays have historically possessed a zero-sum element. In the late 1960s and 1970s, US economic power declined relative to the rise of the Japanese and Western European economies, with the US dollar also becoming less attractive. And, as American power eroded, so did international regimes (such as the Bretton Woods System in 1973). A world without American hegemony is one where great power wars re-emerge, the liberal international system is supplanted by an authoritarian one, and trade protectionism devolves into restrictive, anti-globalisation barriers. This, at least, is one possibility we can forecast in a future that will inevitably be devoid of unrivalled US primacy.

### Adv 2

**Advantage two is terrorism.**

**Major threat of nuclear terrorism**

**Schneidmiller 8/1** (Chris, deputy editor at Global Security Newswire for five years, leads a team reporting on nonproliferation and weapons of mass destruction,, August 1, 2012, “Nuclear Smuggling Shows Terrorist WMD Threat Persists: State Department,” Global Security Newswire, <http://www.nti.org/gsn/article/state-report/>)

WASHINGTON -- The U.S. State Department on Tuesday said the attempted smuggling of nuclear arms-grade uranium in recent years illustrates a continued risk that terrorists could acquire the ingredients for a weapon of mass destruction (see GSN, Aug. 19, 2011).¶ The department's Country Reports on Terrorism 2011 touts as "largely successful" multilateral programs aimed at locking down chemical, biological, radiological and nuclear materials around the globe.¶ However, "the illicit trafficking of these materials persists, including instances involving highly enriched uranium in 2010 and 2011," according to a chapter titled "The Global Challenge of Chemical, Biological, Radiological and Nuclear Terrorism."¶ "These examples suggest that caches of dangerous material may exist on the black market and that we must complement our efforts to consolidate CBRN materials and secure facilities with broader efforts to detect, investigate, and secure CBRN materials that have fallen outside of proper control," the report says. "We must remain vigilant if we hope to prevent terrorist groups from obtaining the means and methods for generating CBRN weapons."¶ The document does not cite specific examples of HEU smuggling from the last two years and the State Department on Wednesday did not provide additional detail.¶ Authorities in Georgia and nearby nations in recent years have reported breaking up attempts to sell illicit nuclear and radiological materials (see GSN, April 16). A June 2011 case in Moldova was said to involve 2.2 pounds of uranium 235 (see GSN, May 25).¶ Violent extremists have made known their desire to obtain and employ nuclear and other unconventional arms materials, the report says. The danger is heightened by the potential for such a weapon to produce significant casualties and destruction, along with the wide access to information on those systems. There are also complications inherent in attempting to control equipment and materials that can be used for either good or ill purposes, the department said.¶ The State report cites a number of multilateral programs aimed at preventing the spread of unconventional weapons materials.¶ These include the Proliferation Security Initiative, under which 100 nations have pledged to take necessary measures to interdict potential illegal transport of WMD materials. The State and Defense departments in 2011 conducted a number of exercises and workshops with participating nations such as Canada, Colombia Italy and Mongolia, the report says.¶ Other initiatives include the U.S.-Russian-led Global Initiative to Combat Nuclear Terrorism, which now encompasses 83 countries, and the National Nuclear Security Administration's Second Line of Defense program that deploys radiation detection technology to partner countries.¶ "Organizations and initiatives concerned with chemical and biological weapons use international conventions and regulations to reduce stockpiles of material, regulate the acquisition of dual-use technology, and eliminate trade of specific goods," the department said. "Nuclear and radiological initiatives and programs focus on promoting peaceful uses of nuclear material and energy, safeguarding against diversion, and countering the smuggling of radioactive and nuclear material. U. S. participation within, and contribution to, these groups is vital to ensure our continued safety from the CBRN threat."¶ The 2011 deaths of al-Qaida leader Osama bin Laden and other operatives placed the terrorist organization "on a path of decline that will be difficult to reverse," the State Department said. However, it noted the increasing prominence of al-Qaida branches such as the Yemen-based al-Qaida in the Arabian Peninsula.¶ "We are very concerned about the growth of the affiliates," Daniel Benjamin, the State Department counterterrorism coordinator, said at a press briefing on Tuesday. "We are working closely with partner nations around the world. In the case of al-Qaida in the Arabian Peninsula, which is I think everyone agrees is the most dangerous of the affiliates, that’s a group that benefited from the long political transition, the turmoil that was going on in Yemen."¶ He said, though that new Yemeni President Abd-Rabbu Mansour Hadi is "a very committed, very reliable partner now. And our work with Yemen is going very, very well. So while the group did exploit that period of uncertainty, we think the trend lines are going in the right direction now in Yemen."¶ More than 12,500 people died last year in more than 10,000 terrorist strikes spanning 70 nations, Benjamin said. That figure represents a 12 percent reduction from the previous year.¶ Foggy Bottom continues to list Cuba, Iran, Sudan and the embattled Assad regime in Syria as state sponsors of terrorism.¶ "Iran is and remains the pre-eminent state sponsor of terrorism in the world," Benjamin said. "We are deeply concerned about Iran’s activities on its own through the [Iranian Revolutionary Guard]-Quds Force. And also, together with Hezbollah, as they pursue destabilizing activities around the globe, we are firmly committed to working with partners and allies to counter and disrupt Iranian activities and to prevent Iran from sponsoring new acts of [terror]. And we think that the international community is increasingly alert to this threat and will resist it."

**Current drones aren’t effective at monitoring terrorist threats – crash in Iran proves**

**Lister 11** (Tim, Dec 15, 2011, Executive Editor at CNN, former BBC editor, “Crashed drone was looking at Iran Nuclear Sites,” CNN, <http://security.blogs.cnn.com/2011/12/15/crashed-drone-was-looking-at-iran-nuclear-sites/>)

The Sentinel drone that crashed in Iran last week was on a surveillance mission of suspected nuclear sites in the country, U.S. military officials tell CNN.¶ Previously, U.S. and NATO officials had said the drone was on a mission to patrol the Afghan-Iran border and had veered off course.¶ The officials say the Afghan government was unaware of the use of its territory to fly surveillance drones over Iran, and that the CIA had not informed the Defense Department of the drone's mission when reports first emerged that it had crashed. One official told CNN that the U.S. military "did not have a good understanding of what was going on because it was a CIA mission."¶ In Kabul Wednesday U.S. Defense Secretary Leon Panetta refused to comment directly on the specifics of the drone's mission but did not deny that it had been spying on Iran and said the drone program carried out "important intelligence operations which we will continue to pursue."¶ The RQ-170 Sentinel is one of the United States' most sophisticated drones and flies at up to 50,000 feet. It is designed to evade sophisticated air defenses. One former intelligence official told CNN that it's "impossible to see" and discounted Iranian claims that it had been brought down by some form of electronic counter-measures.¶ "It simply fell into their laps," he said - after satellite communication was lost.¶ An Iranian engineer working on the captured drone claimed to the Christian Science Monitor that Iran was able to overtake the drone control system and land it. The engineer described to reporter Scott Peterson how Iran was able to exploit a vulnerability in the drone system.¶ House Intelligence Committee Chairman Mike Rogers said categorically that Iran had nothing to do with the fate of the aircraft.¶ "I will say without hesitation that this was not something that anyone had anything to do with, coming down with, other than a technical problem," he said. "I will tell you there was a technical problem that was our problem, nobody else's problem. I think there is a lot of PR going on."

**Tests show solar powered UAVs are key to monitor and track terrorist activities**

**Energy Harvesting Journal 8/9** (Aug 9, 2012, “Solar powered drone unveiled,” <http://www.energyharvestingjournal.com/articles/solar-powered-drone-unveiled-00004639.asp?sessionid=1>)

Silent Falcon™ UAS Technologies has unveiled the highly anticipated Silent Falcon™ solar electric un~~manned~~ aerial system (UAS) at the Association for Un~~manned~~ Vehicle Systems International (AUVSI) conference in Las Vegas, making us of thin film photo voltaic solar energy collection and lithium polymer batteries for energy storage. The company is collaborating with Bye Aerospace to develop the small tactical UAS designed to be man-portable for longer duration intelligence, surveillance and reconnaissance (ISR) missions.¶ ¶ Silent Falcon™ employs proprietary technological advancements in aeronautical design; electrical propulsion systems, solar energy capture, storage and management; latest-generation electro-optical and infrared sensors; advanced target identification and tracking methodologies; and unique target image and data capture and transmission capabilities. The combined result is a tactical UAS and sensor system with capabilities that exceed any UAS in its class.¶ ¶ John W. Brown, CEO of Silent Falcon™ UAS Technologies, said "After over two years of development, we are excited to bring this extraordinary sUAS to market. We believe we have introduced truly disruptive technological innovation to the sUAS market, and are proud to introduce Silent Falcon™, the UAS that embodies the latest aerospace, electronic and sensor technologies to enable it to "Fly Silent, Fly Longer and See More."

**Nuclear Terrorism outweighs all impacts despite low probability – not deterrable would quickly escalate**

**Montgomery 2009** - Evan Braden Montgomery, Research Fellow for CSBA, has published on a range of issues, including alliance politics, nuclear terrorism, military doctrine, and political revolutions. Mr. Montgomery is also a doctoral candidate. (Nuclear Terrorism Assessing the Threat, Developing a Response, The Center for Strategic and Budgetary Assessments (CSBA) is an independent, nonpartisan policy research institute established to promote innovative thinking and debate about national security strategy and investment options. 2009)

Nuclear terrorism thus **remains the most serious**, although not the most likely, form of WMD terrorism. Moreover, while the probability of an attack is relatively low, the threat itself is unfortunately not ephemeral. Presently, the greatest source of concern with regard to terrorist use of unconventional weapons in general and nuclear weapons in particular stems from al Qaeda and its affiliates. Not only have Osama bin Laden and his followers sought these weapons for years, but conventional wisdom holds that they would be **unlikely to show** restraint if they acquired them. Although states can be deterred, a religiously-motivated, transnational terrorist organization like al Qaeda is far less likely to be discouraged from using WMD—including nuclear weapons—by the prospect of overwhelming retaliation. With no “return address” or fixed assets to hold at risk, a determination to inflict mass casualties against its enemies, and a readiness to use suicide operations in order to achieve its goals, traditional notions of deterrence that guided US strategy successfully during the Cold War would seem to offer a much lower chance of success in this case. 27 It is important to note, however, that the prospect of a nuclear terrorist attack was a growing concern before al Qaeda was identified as the central threat to US security, and it is likely to remain a danger even after al Qaeda is discredited and defeated. As Rolf Mowatt-Larssen, former Director of the Department of Energy’s (DOE) Office of Intelligence and Counterintelligence, has argued: It would be a mistake ... to view nuclear terrorism strictly through the prism of the threat posed by al-Qaeda today ... the sober reality is that the threat posed by nuclear terrorism is much broader than the aspiration of any single terrorist group. We live in a world of escalating levels of asymmetric vulnerabilities. Increasing numbers of disaffected groups are turning to violence to achieve their goals ... The extremes of 20 years ago are no longer extreme, and we must guard against any conventional thinking that places limits on the art of the possible for terrorist action. It is precisely the potential to surprise, along with the asymmetric impact of weapons of mass destruction that makes them appealing to the desperate designs of terrorists. 28 In short, because it is rooted in a number of trends—several of which are discussed below—that are likely to persist for some time, it appears that the danger of nuclear terrorism, while small, will nonetheless remain an enduring feature of the security environment.

**nuclear terrorism is extremely likely and is comparatively the largest threat to international stability**

-this evidence cites multiple peer-reviewed studies as well as terrorist group statements

-answers defense based on means – there’s lots of unsafe material around the world and a lot of providers

-answers defense based on motives – terrorists have an incentive to spur retaliation because it create chaos

**Jaspal 12** – Associate Professor at the School of Politics and International Relations, Quaid-i-Azam University, Islamabad, Pakistan

(Zafar Nawaz, “Nuclear/Radiological Terrorism: Myth or Reality?”, Journal of Political Studies, Vol. 19, Issue - 1, 2012, 91:111, dml)

The misperception, miscalculation and above all ignorance of the ruling elite about security puzzles are perilous for the national security of a state. Indeed, in an age of transnational terrorism and unprecedented dissemination of dualuse nuclear technology, ignoring nuclear terrorism threat is an imprudent policy choice. The incapability of terrorist organizations to engineer fissile material does noteliminate completely the possibility of nuclear terrorism. At the same time, the absence of an example or precedent of a nuclear/ radiological terrorism does not qualify the assertion that the nuclear/radiological terrorism ought to be remained a myth. Farsighted rationality obligates that one should not miscalculate transnational terrorist groups — whose behavior suggests that they have a death wish — of acquiring nuclear, radiological, chemical and biological material producing capabilities. In addition, one could be sensible about the published information that huge amount of nuclear material is spread around the globe. According to estimate it is enough to build more than 120,000 Hiroshima-sized nuclear bombs (Fissile Material Working Group, 2010, April 1). The alarming fact is that a few storage sites of nuclear/radiological materials are inadequately secured and continue to be accumulated in unstable regions (Sambaiew, 2010, February). Attempts at stealing fissile material had already been discovered (Din & Zhiwei, 2003: 18). Numerous evidences confirm that terrorist groups had aspired to acquire fissile material for their terrorist acts. Late Osama bin Laden, the founder of al Qaeda stated that acquiring nuclear weapons was a“religious duty” (Yusufzai, 1999, January 11). The IAEA also reported that “al-Qaeda was actively seeking an atomic bomb.” Jamal Ahmad al-Fadl, a dissenter of Al Qaeda, in his trial testimony had “revealed his extensive but unsuccessful efforts to acquire enriched uranium for al-Qaeda” (Allison, 2010, January: 11). On November 9, 2001, Osama bin Laden claimed that “we have chemical and nuclear weapons as a deterrent and if America used them against us we reserve the right to use them (Mir, 2001, November 10).” On May 28, 2010, Sultan Bashiruddin Mahmood, a Pakistani nuclear scientist confessed that he met Osama bin Laden. He claimed that “I met Osama bin Laden before 9/11 not to give him nuclear know-how, but to seek funds for establishing a technical college in Kabul (Syed, 2010, May 29).” He was arrested in 2003 and after extensive interrogation by American and Pakistani intelligence agencies he was released (Syed, 2010, May 29). Agreed, Mr. Mahmood did not share nuclear know-how with Al Qaeda, but his meeting with Osama establishes the fact that the terrorist organization was in contact with nuclear scientists. Second, the terrorist group has sympathizers in the nuclear scientific bureaucracies. It also authenticates bin Laden’s Deputy Ayman Zawahiri’s claim which he made in December 2001: “If you have $30 million, go to the black market in the central Asia, contact any disgruntled Soviet scientist and a lot of dozens of smart briefcase bombs are available (Allison, 2010, January: 2).” The covert meetings between nuclear scientists and al Qaeda members could not be interpreted as idle threats and thereby the threat of nuclear/radiological terrorism is real. The 33Defense Secretary Robert Gates admitted in 2008 that “what keeps every senior government leader awake at night is the thought of a terrorist ending up with a weapon of mass destruction, especially nuclear (Mueller, 2011, August 2).” Indeed, the nuclear deterrence strategy cannot deter the transnational terrorist syndicate from nuclear/radiological terrorist attacks. Daniel Whiteneck pointed out: “Evidence suggests, for example, that al Qaeda might not only use WMD simply to demonstrate the magnitude of its capability but that it might actually welcome the escalation of a strong U.S. response, especially if it included catalytic effects on governments and societies in the Muslim world. An adversary that prefers escalation regardless of the consequences cannot be deterred” (Whiteneck, 2005, Summer: 187) Since taking office, President Obama has been reiterating that “nuclear weapons represent the ‘gravest threat’ to United States and international security.” While realizing that the US could not prevent nuclear/radiological terrorist attacks singlehandedly, he launched 47an international campaign to convince the international community about the increasing threat of nuclear/ radiological terrorism. He stated on April 5, 2009: “Black market trade in nuclear secrets and nuclear materials abound. The technology to build a bomb has spread. Terrorists are determined to buy, build or steal one. Our efforts to contain these dangers are centered on a global non-proliferation regime, but as more people and nations break the rules, we could reach the point where the center cannot hold (Remarks by President Barack Obama, 2009, April 5).” He added: “One terrorist with one nuclear weapon could unleash massive destruction. Al Qaeda has said it seeks a bomb and that it would have no problem with using it. And we know that there is unsecured nuclear material across the globe” (Remarks by President Barack Obama, 2009, April 5). In July 2009, at the G-8 Summit, President Obama announced the convening of a Nuclear Security Summit in 2010 to deliberate on the mechanism to “secure nuclear materials, combat nuclear smuggling, and prevent nuclear terrorism” (Luongo, 2009, November 10). President Obama’s nuclear/radiological threat perceptions were also accentuated by the United Nations Security Council (UNSC) Resolution 1887 (2009). The UNSC expressed its grave concern regarding ‘the threat of nuclear terrorism.” It also recognized the need for all States “to take effective measures to prevent nuclear material or technical assistance becoming available to terrorists.” The UNSC Resolution called “for universal adherence to the Convention on Physical Protection of Nuclear Materials and its 2005 Amendment, and the Convention for the Suppression of Acts of Nuclear Terrorism.” (UNSC Resolution, 2009) The United States Nuclear Posture Review (NPR) document revealed on April 6, 2010 declared that “terrorism and proliferation are far greater threats to the United States and international stability.” (Security of Defence, 2010, April 6: i). The United States declared that it reserved the right to“hold fully accountable” any state or group “that supports or enables terrorist efforts to obtain or use weapons of mass destruction, whether by facilitating, financing, or providing expertise or safe haven for such efforts (Nuclear Posture Review Report, 2010, April: 12)”. This declaration underscores the possibility that terrorist groups could acquire fissile material from the rogue states**.**

**Oil and gas reserves are at major risk, long endurance UAVs key to protect them; the impact is major environmental damage and major disruptions in the oil market**

**Aeronautics 07** (2007, “Pipeline Monitoring & Oil and Gas Security” <http://www.aeronautics-sys.com/?CategoryID=259&ArticleID=188>)

Offshore oil & gas installations are extremely valuable assets, situated across extensive maritime areas that are difficult to guard. Attacks or damage to such installations can lead to enormous ecological damage, revenue losses and chaos on international oil markets. Improving oil and gas security security is a matter of global importance. ¶ UAVs are today emerging as highly effective tools for confronting pipeline monitoring, and oil and gas security challenges. While others have speculated about the possible use of UAVs in offshore oil security, Aeronautics has put theory into practice, becoming a world pioneer in this field.¶ Oil and Gas Security – UAV Systems ¶ ¶ For over three years, since 2003, the Company’s Aerostar Tactical UAVs have been patrolling offshore oil fields on a regular basis. Even at night, the Aerostar’s FLIR camera reveals the presence of thieves and potential kidnappers, who often try to reach the rigs using small boats. Oil leaks and slicks also show up clearly in infrared, and by detecting them early Aerostar has saved oil companies millions in fines, which are imposed automatically for such leaks. ¶ The Aerostar’s flight profile, with its 12 hours endurance, slow loitering speed and fully programmable flight path, make it ideal for this surveillance role. Aerostar can remain in the air the whole night long and inspect each rig thoroughly. Using ~~manned~~ aircraft for this role is impractical, because the frequent maintenance required to support so many flight hours would be extremely costly and time consuming, and the inevitable boredom involved would raise dangers for the pilot.¶ ¶ Pipeline Monitoring – UAV Systems ¶ Another critical role for the UAV is the infrared inspection of the thousands of miles of pipelines that transport oil and gas around the world. Oil and gas leaks show up well in infrared because of the temperature differences between the fluid and the soil. Undetected leaks have frequently caused disastrous fires, explosions and loss of life, as well as heavy economic losses. Again, the UAV is the best and most economical type of platform for this inspection work.

**Environmental destruction is the greatest threat to human survival.**

**Coyne and Hoekstra 7** – \*professor in the Department of Ecology and Evolution at the University of Chicago, \*\*Associate Professor in the Department of Organismic and Evolutionary Biology at Harvard University (Jerry and Hopi, The New Republic, “The Greatest Dying,” 9/24, http://www.truthout.org/article/jerry-coyne-and-hopi-e-hoekstra-the-greatest-dying)

  But it isn't just the destruction of the rainforests that should trouble us. Healthy ecosystems the world over provide hidden services like waste disposal, nutrient cycling, soil formation, water purification, and oxygen production. Such services are best rendered by ecosystems that are diverse. Yet, through both intention and accident, humans have introduced exotic species that turn biodiversity into monoculture. Fast-growing zebra mussels, for example, have outcompeted more than 15 species of native mussels in North America's Great Lakes and have damaged harbors and water-treatment plants. Native prairies are becoming dominated by single species (often genetically homogenous) of corn or wheat. Thanks to these developments, soils will erode and become unproductive – which, along with temperature change, will diminish agricultural yields. Meanwhile, with increased pollution and runoff, as well as reduced forest cover, ecosystems will no longer be able to purify water; and a shortage of clean water spells disaster.

    In many ways, oceans are the most vulnerable areas of all. As overfishing eliminates major predators, while polluted and warming waters kill off phytoplankton, the intricate aquatic food web could collapse from both sides. Fish, on which so many humans depend, will be a fond memory. As phytoplankton vanish, so does the ability of the oceans to absorb carbon dioxide and produce oxygen. (Half of the oxygen we breathe is made by phytoplankton, with the rest coming from land plants.) Species extinction is also imperiling coral reefs – a major problem since these reefs have far more than recreational value: They provide tremendous amounts of food for human populations and buffer coastlines against erosion.

    In fact, the global value of "hidden" services provided by ecosystems – those services, like waste disposal, that aren't bought and sold in the marketplace – has been estimated to be as much as $50 trillion per year, roughly equal to the gross domestic product of all countries combined. And that doesn't include tangible goods like fish and timber. Life as we know it would be impossible if ecosystems collapsed. Yet that is where we're heading if species extinction continues at its current pace.

    Extinction also has a huge impact on medicine. Who really cares if, say, a worm in the remote swamps of French Guiana goes extinct? Well, those who suffer from cardiovascular disease. The recent discovery of a rare South American leech has led to the isolation of a powerful enzyme that, unlike other anticoagulants, not only prevents blood from clotting but also dissolves existing clots. And it's not just this one species of worm: Its wriggly relatives have evolved other biomedically valuable proteins, including antistatin (a potential anticancer agent), decorsin and ornatin (platelet aggregation inhibitors), and hirudin (another anticoagulant).

    Plants, too, are pharmaceutical gold mines. The bark of trees, for example, has given us quinine (the first cure for malaria), taxol (a drug highly effective against ovarian and breast cancer), and aspirin. More than a quarter of the medicines on our pharmacy shelves were originally derived from plants. The sap of the Madagascar periwinkle contains more than 70 useful alkaloids, including vincristine, a powerful anticancer drug that saved the life of one of our friends.

    Of the roughly 250,000 plant species on Earth, fewer than 5 percent have been screened for pharmaceutical properties. Who knows what life-saving drugs remain to be discovered? Given current extinction rates, it's estimated that we're losing one valuable drug every two years.

    Our arguments so far have tacitly assumed that species are worth saving only in proportion to their economic value and their effects on our quality of life, an attitude that is strongly ingrained, especially in Americans. That is why conservationists always base their case on an economic calculus. But we biologists know in our hearts that there are deeper and equally compelling reasons to worry about the loss of biodiversity: namely, simple morality and intellectual values that transcend pecuniary interests. What, for example, gives us the right to destroy other creatures? And what could be more thrilling than looking around us, seeing that we are surrounded by our evolutionary cousins, and realizing that we all got here by the same simple process of natural selection? To biologists, and potentially everyone else, apprehending the genetic kinship and common origin of all species is a spiritual experience – not necessarily religious, but spiritual nonetheless, for it stirs the soul.

    But, whether or not one is moved by such concerns, it is certain that our future is bleak if we do nothing to stem this sixth extinction. We are creating a world in which exotic diseases flourish but natural medicinal cures are lost; a world in which carbon waste accumulates while food sources dwindle; a world of sweltering heat, failing crops, and impure water. In the end, we must accept the possibility that we ourselves are not immune to extinction. Or, if we survive, perhaps only a few of us will remain, scratching out a grubby existence on a devastated planet. Global warming will seem like a secondary problem when humanity finally faces the consequences of what we have done to nature: not just another Great Dying, but perhaps the greatest dying of them all.

**Oil shocks risk extinction**

**Roberts 04** (Paul, Regular Contributor to Harpers and NYT Magazine, “The End of Oil: On The Edge of a Perilous New World”, p. 93-94)

The obsessive focus on oil is hardly surprising, given the stakes. In the fast-moving world of oil politics, oil is not simply a source of world power, but a medium for that power as well, a substance whose huge importance enmeshes companies, communities, and entire nations in a taut global web that is sensitive to the smallest of vibrations. A single oil "event" — a pipeline explosion in Iraq, political unrest in Venezuela, a bellicose exchange between the Russian and Saudi oil ministers — sends shockwaves through the world energy order, pushes prices up or down, and sets off tectonic shifts in global wealth and power. Each day that the Saudi-Russian spat kept oil supplies high and prices low, the big oil exporters were losing hundreds of millions of dollars and, perhaps, moving closer to financial and political disaster — while the big consuming nations enjoyed what amounted to a massive tax break. Yet in the volatile world of oil, the tide could quickly turn. A few months later, as anxieties over a second Iraq war drove prices up to forty dollars, the oil tide abruptly changed directions, transferring tens of billions of dollars from the economies of the United States, Japan, and Europe to the national banks in Riyadh, Caracas, Kuwait City, and Baghdad, and threatening to strangle whatever was left of the global economic recovery. So embedded has oil become in today's political and economic spheres that the big industrial governments now watch the oil markets as closely as they once watched the spread of communism — and with good reason: six of the last seven global recessions have been preceded by spikes in the price of oil, and fear is growing among economists and policymakers that, in today's growth-dependent, energy-intensive global economy, oil price volatility itself may eventually pose more risk to prosperity and stability and simple survival than terrorism or even war.

### Solvency

**Contention three is solvency.**

**Solar powered drones have been tested to work and stay up for over two weeks**

**Hennigan 10** (W.J., Provides in-depth coverage of the aerospace industry for LA Times, December 27, 2010, “Solar-powered drone stays aloft for two weeks, breaking endurance records,” LA Times, <http://latimesblogs.latimes.com/technology/2010/12/zephyr-long-endurance-drone-qinetiq.html>)

A lightweight, solar-powered drone with a massive 73-foot wingspan flew above the clouds for 14 days straight, shattering long-standing aviation endurance records, according to the Fédération Aéronautique Internationale.¶ The international governing body for aeronautics confirmed last week that the solar-powered robotic plane, dubbed Zephyr, soared above the U.S. Army's Yuma Proving Ground in Arizona from July 9 to July 23.¶ Built by British defense contractor QinetiQ, the drone’s 336 hour, 22 minute flight crushed the previous endurance record for a robotic plane, which was held by Northrop Grumman Corp.’s Global Hawk drone. That un~~manned~~ flight, which took place in March 2001, lasted 30 hours and 24 minutes.¶ The Zephyr’s flight also marked the longest time an airplane flew without refueling. The previous mark was set in December 1986 by the Rutan Aircraft Factory’s Voyager and its milestone of 216 hours and three minutes. The Voyager, which had a pilot in the cockpit, was the first plane to travel around the world without stopping or refueling.¶ The Zephyr, which resembles an oversized version of those balsa wood gliders you threw at classmates in grammar school, was remotely piloted and carried British military communications equipment. ¶ With the help of five people, it was hand-launched from the Yuma test range and climbed to an altitude of more than 70,000 feet using solar panels on the plane’s wing.

**DoD and private sector cooperation is key to effective solar-powered development**

**Atwood 09** (Major Scott K, US Marine Corps, April 15, 2009, “Alternative Fuel Sources for Military Aviation,” <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA509846>)

DoD is not a large enough customer to drive the alternative fuel market or to be¶ the sole developer of alternative fuels.¶ lOI¶ In 2005, DoD only consumed 1.2% of the¶ nations total fuel usage and only 52% was used for aviation fuel.¶ 102¶ The use of¶ alternative fuel in military aviation will have to be developed by the civilian sector with¶ encouragement, cooperation and funding from the US government. Many companies¶ including Boeing, Airbus, Air New Zealand, NASA, Virgin Atlantic, have already begin¶ the R&D of alternative fuels in aviation with positive results.¶ 103¶ Both civilian and military aviation will benefit from advances made in alternative¶ fuels research for the aviation industry. Out of the four alternative fuel sources¶ researched in the paper, biofuels and synthetic fuels exhibit the most potential for military¶ aviation from the research and analysis conducted for this paper.¶ Solar power and hydrogen fuel cells have successfully been demonstrated as¶ potential alternative fuel sources for UAV and ~~manned~~ light civil aviation. Due to¶ previously mentioned logistic, engineering and design limitations, neither alternative fuel¶ source can be considered a viable option for ~~manned~~ military aviation use.

**Federal grants are comparably better for solar power development**

**Galbraith 11** (Kate, October 25, 2011, “Future of Solar and Wind Power May Hinge on Federal Aid,” NY Times, <http://www.nytimes.com/2011/10/26/business/energy-environment/future-of-solar-and-wind-power-may-hinge-on-federal-aid.html?_r=1&pagewanted=all>)

IN recent years, wind and solar power have been among the fastest-growing sources of energy in the country.¶ But questions loom over their future: Will federal incentives that are important to their growth continue? And what happens if those incentives expire?¶ For wind power, the situation is especially precarious, energy specialists say. The federal production tax credit, which has provided incentives for wind farm operators to produce power since 1992, expires at the end of 2012. Congress has extended it in the past, most recently in 2009 as part of the federal stimulus package. But this time, some in the industry fear that the mood for limited government in Washington could imperil an extension.¶ If Congress does not extend the credit, “I believe 2013 would have minimal if not close to zero wind built in the United States,” said Michael O’Sullivan, the senior vice president for development at NextEra Energy Resources, a huge clean energy developer in Juno Beach, Fla.¶ The solar business faces the expiration of an important grant program at the end of this year. The grants were created as part of the stimulus package, and the industry is lobbying for a one-year extension.¶ The expiration of the program would have a “really significant compressing effect on the amount of renewable energy that gets financed,” said Edward Fenster, the chief executive of SunRun, a San Francisco-based company that leases solar installations to homeowners. An extension would allow SunRun’s business to grow 50 percent faster, though the company would grow even without it, he said.¶ Even if the grants expire, the solar industry can still use a 30 percent federal investment tax credit in place through 2016. Some other technologies, like fuel cells and small wind turbines, have access to similar tax credits through 2016.¶ The solar industry argues that the grant program is far more effective than the tax credit because it provides incentives for a broader range of private investors to help finance projects, as opposed to merely those with high tax obligations (the credit helps offset these).¶ The grant program also applies to wind power, though wind developers say the tax credit is more important for their industry.¶ Another major federal program, the provision of loan guarantees to aid large renewable energy projects, ended last month. That program became controversial after Solyndra, the first solar recipient, filed for bankruptcy, leaving taxpayers potentially liable for more than $500 million.¶ Rhone Resch, president and chief executive of the Solar Energy Industries Association, said that while the loan guarantee program helped finance emerging technologies that were “higher-risk projects by definition,” the grant program aided “extremely low-risk projects where you’re using off-the-shelf technology.”¶ In arguing for the continuation of federal incentives, advocates of renewable energy often point out that all forms of energy — including fossil fuels — rely on a complex web of state and federal credits and aid. Mr. Resch argues that more established technologies including oil and gas, coal and nuclear power are still taking advantage of incentives that were established in the 20th century.¶ “In the same way we’ve invested in oil and gas, it’s time to invest in renewables,” he said.¶ For younger technologies trying to establish themselves and reduce their costs, government incentives may be a make-or-break situation.¶ “Unlike oil and gas, where those companies could still make money doing their operating if they didn’t have some of the credits they currently have, I’m not sure that would be true for the wind industry,” said Amy Jaffe, director of the Energy Forum at Baker Institute at Rice University.¶ Solar and wind companies also argue that the perpetual threat that their incentives will expire makes long-term planning difficult.¶ “Our biggest issues is, we don’t have certainty,” said Danny Kennedy, founder of Sungevity, a residential solar installer in Oakland, Calif., who said he hoped that the federal grant program would be renewed but planned for its expiration. Fossil fuel companies, Mr. Kennedy said, “assume tax credits and subsidies as permanent and given.”

**Military grants for solar powered UAVs empirically work best**

**Wald 11** (Matthew L., writer on energy policy for thirty years for the NY Times, February 4, 2011, “Clean-energy firms, find private investors; projects aided by grants from U.S. attract $4 for every $1 taxpayers spent,” The International Herald Tribune, lexis)

In late 2009, the U.S. government gave $151 million in grants to advance 37 clean-energy ideas deemed too radical or too preliminary to attract much private financing - like electricity storage that mimics photosynthesis and batteries that double or triple the amount of energy they can store.¶ Since then, six of the projects have made enough progress to attract $108 million in private venture capital financing - about four private dollars for every dollar that the taxpayers spent to get them rolling - the Department of Energy was to announce Thursday.¶ While none of the projects are expected to result in commercial products for years to come, the Obama administration is emphasizing the early signs of success as it seeks to persuade a sometimes skeptical Congress to approve more money for clean-energy innovation.¶ Success is probably 10 to 20 years away, said Arun Mujamdar, director of the program, which is called the Advanced Research Projects Agency-Energy. But the private investment is ''a good sign, an endorsement of some sort,'' he said. ''The best thing the government can do is to catalyze investment.''¶ While 31 projects have not yet attracted outside help, all are continuing, according to the department. Josh Lerner, a professor at Harvard Business School and an expert on venture capital, said he would have been surprised if most of the projects had quickly attracted private financing. If all the projects had quickly drawn private money, it would have suggested that the projects would have happened without government intervention, Mr. Lerner said.¶ With a track record of 6 of 37 being picked up, ''it's hard not to feel it's a reasonable indicator that they're doing something right,'' he said.¶ While the government took ownership stakes in automakers and banks that got taxpayer help, it has not done so with the energy companies it has financed through the program, known as ARPA-E, so taxpayers reap no direct benefits.¶ Congress modeled the program after the better-known Defense Advanced Research Projects Agency, or Darpa, which provided early seed money for the Internet and sponsored competitions to build sophisticated robotic vehicles, among other projects. Most of Darpa's projects fail to produce commercial products, but the basic research it finances has sometimes led to breakthroughs.¶ For the first round of ARPA-E projects, the Energy Department focused on wind and solar energy production, energy storage and the capture and storage of carbon dioxide. No carbon storage project attracted outside investment, in part because investors no longer expect a government cap on carbon dioxide emissions to help drive demand. But sun and wind power and storage technologies did lure investors.¶ Envia Systems, which received $4 million in government money, used a material licensed from Argonne National Laboratory to build a better cathode, or negative terminal, for a battery. Envia, which is based in Newark, California, recently signed a contract with General Motors to begin delivery in 2014 of a material that will let batteries store roughly twice as much electricity per kilogram compared with the batteries now going into the Chevrolet Volt, said Michael Sinkula, a co-founder of the company.¶ Envia recently raised $17 million from an alliance of investors that included G.M., and it is now pursuing research on a better anode, or positive terminal, which will yield an even bigger improvement in the weight-to-energy ratio, Mr. Sinkula said.¶ Another battery company, 24M, a spinoff of the Massachusetts Institute of Technology and A123 Systems, got a $2.55 million government grant and took in $10 million in venture capital money. It is also working on a lithium-ion battery with much higher energy density.¶ A solar cell company, 1366 Technologies, got $4 million from ARPA-E and has raised $33.4 million in private money. 1366, based in Lexington, Massachusetts, casts silicon wafers, a basic building block of solar cells, directly into their final form, which is 0.008 inch thick. That 0.2-millimeter cast cuts the price of the finished solar cells about 40 percent, the company said.¶ Sun Catalytix, of Cambridge, Massachusetts, uses a catalyst to help break up water molecules when they are exposed to electric current. The hydrogen from the water is absorbed by other molecules into an energy-rich material that can be burned in an internal combustion engine or converted back into electricity, said Amir Nashat, who is the acting chief executive of the company and also a principal in the venture capital firm Polaris Venture Partners.¶ Polaris and others, including Tata of India, put $9.5 million into the company after it got a $4 million ARPA-E grant. But Sun Catalytix is still years from releasing a product, Mr. Nashat said.¶ The two other companies financed by ARPA-E that attracted private investment were General Compression, which is developing a demonstration plant for a method to store electricity for later use and leveraged a $750,000 grant into $12 million in private capital; and FloDesign, which is working on a more efficient wind turbine based on the design of jet engines and used its $8.3 million grant to eventually raise another $27 million.

**DoD is key**

**Reichert et al 12** (Joshua – managing director, Phyllis Cuttino – project director, Laura Lightbody – manager, Joseph Dooley – senior associate, Jessica Frohman Lubetsky – senior associate, Brendan Reed – associate, David Catarious – former Pew staffer, Gavin Feiger – fellow, David Harwood – consultant from Good Works Group, “From Barracks to the Battlefield,” Pew Report, http://www.pewenvironment.org/uploadedFiles/PEG/Publications/Report/DoD-Report\_FINAL.pdf)

In recent decades, DoD technology development efforts have supported commercial development of computers, the Internet, the Global Positioning System, semiconductors and many more innovations. DoD has a broad range of strengths that can help accelerate clean energy technology development and commercial maturity. These include an established research and development infrastructure, ability to grow demonstration projects to scale, significant purchasing power and the necessary culture and management infrastructure necessary to foster innovation. In recent years, DoD has begun to harness these capabilities in service of energy technology innovation. Its budget for energy security initiatives has risen from $400 million to $1.2 billion in the past four years,3 and market experts project steadily increased expenditures for energy innovation activities in the coming years. Pike Research estimates that DoD investments in advanced energy technologies will reach $10 billion a year by 2030.4