Western States Legal Foundation

Information Bulletin **Fall 2002**

The Military Space Plane, Conventional ICBM's, and the Common Aero Vehicle: Overlooked Threats of Weapons Delivered Through or From Space

Throughout the late 1990's, U.S. programs developing new weapons intended to operate through and from space proceeded largely out of public view, pushed forward by aerospace contractors, think tank military transformation promoters, and space weapons advocates in the military and Congress. The Bush Administration has brought the space weapons enthusiasts to the forefront, led by Defense Secretary Donald Rumsfeld.[1] With the ascendance of the space warriors and the Bush administration's determination to push forward with research on a wide variety of missile defense technologies, U.S. space weapons programs are attracting increased attention.

Much of that attention, however, is focused on systems that would be placed in orbit. These include the space-based laser and various kinds of kinetic kill devices, that could be used for a variety of military purposes ranging from anti-satellite warfare to missile defense to destroying targets in the atmosphere or on the ground. Most such systems are decades from deployment. They present significant technical obstacles and operational issues, including the vulnerability of complex, expensive systems in orbit to attack.

Widely overlooked, the U.S. also is exploring new ways to deliver weapons through and from space in the near term– a potentially destabilizing undertaking. These new systems, evolutionary improvements of existing technologies, would be very difficult to defend against, and if approved could be deployed in the next ten to fifteen years. They include highly accurate long-range ballistic missiles with non-nuclear warheads, maneuverable re-entry vehicles that could deliver a variety of weapons, both nuclear and conventional, and a next-generation re-useable launch vehicle that could perform a variety of military missions in space, including weapons delivery, and then land like an airplane.

Labels used by the military for these options are the conventional ballistic missile (CBM), the Common Aero (or Aerospace) Vehicle (CAV), and the Military Space Plane (MSP), sometimes also referred to as the Space Operations Vehicle (SOV). The military targets envisioned for CAV's and conventional ballistic missiles include hardened and deeply buried targets, such as missile silos and underground tunnels or bunkers for command and control or munitions storage, mobile targets such as mobile missile launchers, air defense systems, and ground combat forces in instances where aircraft cannot be deployed quickly enough. The Space Plane could deliver several Common Aero Vehicles. If successful, in the long run the Space Plane also could provide the military with cheaper, more reliable access to space, making the placement of weapons in space more feasible.

There are indications that the Bush Administration intends to move ahead with the first steps towards such systems. The Defense Department has future funding programmed, for example, for "the modification of a strategic ballistic missile system to enable the deployment of a non-nuclear payload."[2] This description could fit either various types of conventional warheads for a submarine launched ballistic missile, a land-based intercontinental ballistic missile (ICBM) or the CAV, envisioned as a more sophisticated system capable of greater maneuvering and the deployment of a variety of submunitions and sensing systems. At the same time, NASA and the Air Force are cooperating in a renewed effort to develop reusable launch vehicles, with the Air Force envisioning a military version that could perform a variety of missions, from delivering CAV's to orbiting satellites.

Global Non-Nuclear Strike: Conventional ICBM's and the Common Aero Vehicle

Two related programs conceived during the 1990's could provide the groundwork for the "non-nuclear payload" envisioned for a modified strategic ballistic missile system. They would take advantage of continuing advancements in U.S. capabilities to deliver weapons accurately over great distances, ranging from upgrades in global positioning systems to improvements in missile reentry vehicle technology. The goal is to build pilotless systems that are accurate and versatile enough to destroy a variety of targets using conventional weapons, at intercontinental range. These systems are the Maneuverable (or, in some planning documents, "Modified") Non Nuclear Reentry Vehicle (MNNRV) and the Common Aero Vehicle (CAV).

Both concepts are intended to expand the types and maneuvering capability of payloads that can be delivered through or from space. The MNNRV would be an improved reentry vehicle, the component that carries the payload of an intercontinental ballistic missile back into the atmosphere. According to the *National Security Space Roadmap*, it "would rely primarily on maneuvers, and very high reentry speeds to evade defenses, thereby aiding penetration to assigned targets. The limited controllability of the MNNRV, allows for precision attacks against high value, time-critical hard surface and hard and deeply buried targets."[3] The increased maneuverability of the MNNRV, along with guidance improvements, would improve accuracy.[4] The CAV is another type of reentry vehicle improvement that would provide additional maneuverability, and that also would allow the delivery through or from space of many of the advanced types of armaments that currently only can be delivered by aircraft. It is a "common" aero vehicle because "The vehicle could serve as a common form of delivery for CBM [conventional ballistic missile], MSP [military space plane], or orbital systems."[5]

Improved maneuvering re-entry vehicles for non-nuclear warheads would not present substantial technical obstacles. The U.S. Air Force *1997 Space Force Application Mission Area Development Plan* (MADP) noted that "Technology for the conventional Modified Non-nuclear RV (MNNRV) concept is fairly mature. With full funding and an aggressive schedule the first operational sortie could be ready in 3 years."[6] Non-nuclear payloads under consideration included penetrators of various types, including both dense heavy rods designed to destroy hard targets by kinetic energy to hardened warheads using high explosives.[7] Some flight testing of ballistic missiles with kinetic energy rods already has

been conducted.[8] The MADP and other contemporaneous planning documents envisioned mounting these MNNRV's on Minuteman ICBM's and basing them at either Vandenberg Air Force Base in California or Cape Canaveral, Florida, both to comply with arms control treaties and to avoid confusion with nuclear weapons if they were launched.[9] It is also conceivable that a non-nuclear reentry vehicle could be delivered by a submarine launched ballistic missile.

Air Force Space Command sees the CAV as a first step towards acquiring the capability to launch conventional weapons from the United States and strike anywhere on earth. According to the *Air Force Space Command Strategic Master Plan for FY02 and Beyond,*

> "During the mid-term [2008-2013], we will expand the options available to our warfighting commanders by fielding an initial global Conventional Strike capability.... CAV will provide warfighting forces with a Conventional Strike capability with near-global range, prompt response time from launch to target, penetration of hostile natural or man-made terrestrial and atmospheric environments and enemy defense avoidance. The CAV system will be capable of dispensing a variety of munitions against ground targets to include WMD storage sites, C2 [command and control] facilities, maritime forces and massed ground forces."[10]

The munitions envisioned for each CAV include "three 250 lb small smart bombs, six 90 lb powered LOCAAS (Low Cost Autonomous Attack System) munitions, a hard and deeply buried target (HDBT) penetrator, a deployable unmanned aerial vehicle (UAV) Hunter/Killer package, an agent defeat payload, and other special weapon payloads."[11] Other CAV payloads under consideration include unmanned aerial vehicles for battle damage assessment and electromagnetic pulse (EMP) weapons designed to disrupt or destroy electronic equipment.[12] The military also does not see the CAV as posing particularly difficult technical problems.[13]

Although still in the concept stage, the conventionally armed CAV appears to have considerable momentum. It was endorsed by the Department of Defense 2001 *Transformation Study Report*.[14] The Department of Defense plans to conduct a study in FY2002 of "Common Aero Vehicle (CAV) Utility for Conventional Deterrence and Global Precision Attack to determine the military utility of conventional precision strike from space transiting systems."[15] The ability to deliver CAV's in large numbers is listed as a requirement in a recent joint Air Force–National Aeronautics and Space Administration (NASA) study on next-generation reusable launch vehicles, a program expected to provide a replacement for NASA's space shuttle and reuseable "space planes" for the military.[16] Air Force insiders are anticipating many years of funding for future missile systems, with new types of reentry vehicles better suited to defeating hard targets likely to be part of the work. In early 2001 the newsletter of the Air Force Space and Missiles Systems Center looked forward to decades of further missile development:

> Over the last year, the force applications team has secured SMC's role in the future missile system commonly referred to as Minuteman IV that hopes to be a $20-30 billion procurement between 2004 and 2040. New missions for the system include holding both hardened and deeply buried

> targets and strategic relocatable targets at risk. Concepts being evaluated for these missions may include an earth penetrator reentry vehicle or a "smart" maneuvering reentry vehicle. With respect to force applications, the Minuteman IV activity is simply the first initiative, among many, for possible future space weapon systems. In parallel with the Minuteman IV is another effort addressing conventional prompt global strike needs which is referred to as the Common Aero Vehicle (CAV).[17]

Conventional ICBM's, the Common Aero Vehicle, and the Potential for More Advanced Nuclear Weapons Delivery Systems

Even the least ambitious version of the CAV– one which would be carried by a Minuteman ICBM and that would deploy conventional munitions already being developed for delivery by conventional aircraft- could have significant destabilizing effects. But if the CAV and the MNNRV system were developed successfully for this limited role, there apparently would be no significant technological obstacles to adapting them to other payloads– including nuclear weapons. Nuclear roles for both the CAV and for the maneuverable re-entry vehicle were considered during concept development for these programs in the late 1990s. One option explored for the Maneuverable Reentry Vehicle was a nuclear earth penetrator warhead, a modification of the B-61 nuclear bomb.[18] The nuclear version as then envisioned would replace existing nuclear re-entry vehicles, and would be based at silos currently used for nuclear ICBM's.[19]

Although the CAV currently is envisioned as a means to deliver conventional weapons, it could be used to deliver nuclear warheads as well, with potential accuracy and maneuverability improvements over existing re-entry vehicles:

> Common Aero Vehicles (CAVs) can deliver both nuclear and non-nuclear weapons to targets anywhere on the globe from CONUS [continental U.S.] bases with appropriate deployment systems. The CAV can be deployed from multiple deployment vehicles including missiles, Military Spaceplanes (MSPs), or space based platforms. The inherent maneuverability of the CAV, provides increased accuracy, lethality, and enemy defense evasion. The aerodynamic shape and glide capability substantially extends the range and cross-range of the weapon system. Additionally, it can be fitted with various sensors to provide for target acquisition, tracking, and identification as well as increased accuracy.[20]

A single Minuteman III ICBM could carry three independently targeted CAV's 7,000 miles or more. Each could carry a variety of conventional munitions or a single nuclear weapon, either a standard existing design or a warhead modified for lower yield or enhanced earth penetrating capabilities.[21]

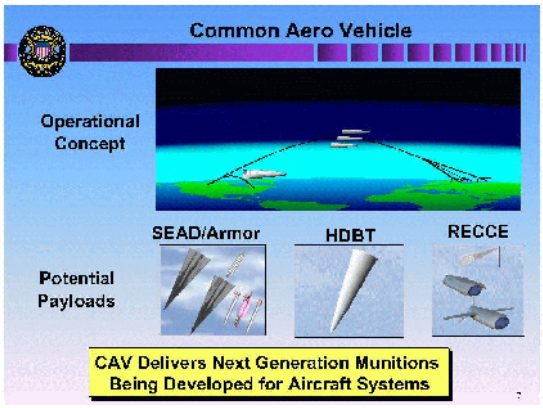
The nuclear CAV concept was abandoned in the 1990's, a time when the climate was inhospitable to the development of new nuclear warheads and delivery systems.[22] In the current context, however, with the Bush Administration advocating both research on new nuclear weapons concepts and pre-emptive strikes against states with weapons of mass destruction that are viewed as a threat, concepts like the nuclear CAV may be revived.[23] The 2002 Nuclear Posture Review stated that

> There are several nuclear weapon options that might provide important advantages for enhancing the nation's deterrence posture: possible modifications to existing weapons to provide additional yield flexibility in the stockpile; improved earth penetrating weapons (EPWs) to counter the increased use by potential adversaries of hardened and deeply buried facilities; and warheads that reduce collateral damage.[24]

The NPR also stated that concept development for next-generation ICBM's is continuing:

> The Air Force Systems Command (AFSPC) led the Ballistic Missile Requirements (BMR) Study (1998 to 2000) which documented a number of needs beyond the current baseline ICBM mission, such as extended range, trajectory shaping, strategic relocatable targets, and hardened deeply buried targets, that the next generation ICBM could address. The Land Based Strategic Nuclear Deterrence Mission Needs Statement (MNS) drew from the analysis done in the BMR study in documenting the need for ICBMs beyond 2020. To expand on the MNS and address alternatives for the follow on ICBM, AFSPC plans to conduct an analysis of alternatives in FY04 and FY05 with an IOC by 2018.[25]

At the time the nuclear armed CAV was being considered in the mid 1990's, the military anticipated that it "would be more accurate and would have greater range. These attributes could allow for lower yields as well as increasing the target set that can be held at risk. Additionally, penetrators could be incorporated to strike buried targets."[26] The target set against which the nuclear CAV would provide added capability included "HDBTs [hard and deeply buried targets], SRTs [strategic relocatable targets, such as mobile missiles], and HFTs (sic) [presumably HST's-- hard surface targets, WMD or missile storage facilities]."[27]



Lieutenant General Bruce Carlson, Director for Force Structure, Resources and Assessment (Joint Staff). Presentation Slides, "Changing Needs & Priorities in Requirements & Capabilities for Future Military Space Forces," National Defense Industrial Association, 2002 Space Policy & Architecture Symposium, February 2002 . SEAD: Suppression of Enemy Air Defense; HDBT: Hard and Deeply Buried Targets; Recce: Reconnaissance.

Conventionally armed CAV's and maneuverable re-entry vehicles also are seen as able to provide improved capabilities against some of these targets, and the military would prefer to use conventional weapons wherever possible. But the military maintains that there are types of targets, particularly deeply buried tunnels and bunkers, that cannot be attacked effectively with conventional weapons. They continue to look for ways of using nuclear weapons that will destroy such installations, while reducing "collateral damage"-- civilian deaths and ecological devastation– to the point where nuclear weapons use is politically feasible.[28]

The Military Space Plane

Another military space program with significant offensive capabilities that has received new impetus under the Bush administration is the Military Space Plane. The Space Plane is the generic label for reuseable vehicles that can be launched into space, perform missions ranging from orbiting satellites to delivering weapons, and than return to earth, landing in a manner similar to the current Space Shuttle. The Space Plane is a major element in the National Aerospace Initiative, a new Department of Defense-led effort to coordinate a variety of government research and development activities. These include hypersonic flight (above five times the speed of sound), reuseable launch vehicles and other means of improving access to space, and a variety of other advanced space technologies.[29] The initiative built on a number of other studies, including a recent joint NASA–Air Force120 Day study of reuseable launch vehicle requirements that resulted in an agreement between NASA the Air Force, and the National Reconnaissance Office to cooperate in NASA's Space Launch Initiative.[30]

NASA initially planned to spend almost $5 billion dollars through FY2006 on its Space Launch Initiative, intended to produce sufficient progress in relevant areas to select technologies and proceed with development of a new reuseable launch vehicle (RLV).[31] The NASA-USAF 120 Day Study begun in late 2001 examined how the Space Launch Initiative could serve the desires both of NASA for a manned follow-on to the Space Shuttle, and of the military for a Space Plane. The 120 Day Study, along with the National Aerospace Initiative and subsequent research in the Space Launch Initiative, was intended to work towards a "credible, comprehensive plan to develop RLVs" that would "consider initial prototype flight as early as 2007."[32] In the fall of 2002 the Bush Administration announced plans to reallocate some Space Launch Initiative funds from research aimed at a "third generation" reuseable launch vehicle that could replace the space shuttle to a smaller, less ambitious "orbital space plane," that could be launched into space by expendable rocket boosters.[33] The orbital space plane is billed as an alternative means to deliver crew and cargo to the International Space Station. It also may be compatible with the military's space plane development path, which emphasizes near-term development of cheaper and more reliable space access and which appears to require less lift capacity than a full-scale shuttle replacement.

"Coercive Space Power:" from "Counterspace" to Global "Preemptive Strikes"

Materials prepared by Air Force and NASA officials for industry briefings reveal the types of missions envisioned by Military Space Plane (MSP) advocates. The Space Plane would conduct "offensive and defensive counterspace operations" employing radio frequency, microwave and jamming systems; deploy a variety of systems for surveillance, communications, and reconnaissance, and would provide "Decisive Precision Firepower."Offensive missions would include "Covert and Non-nuclear strike," and "Halt Phase" operations against a mobile adversary before other U.S. forces could be deployed.[34] Space Plane combat operations "may include preemptive strikes" against "hard and deeply buried targets," "National level leadership control nodes," "WMD and missile launch and storage sites," air defense systems, and a variety of other targets.[35] The briefing materials noted that the MSP is intended to be

a "real coercive space power system," and stressed that there should be a strong "Focus on Military Utility—There is NO Business Case for MSP." (Emphasis original). The briefers urged their audience to "Think Like a Warfighter (Dead Targets are the Product)."[36]

The primary means of delivering munitions from the Military Space Plane would be the Common Aero Vehicle (CAV). Together, they are seen as providing a powerful new weapons system able to strike anywhere on earth with a variety of high tech weapons As explained in a "White Paper" prepared by MSP advocates in connection with the NASA-Air Force 120 day study,

Once a target is identified, the spaceplane can respond from the U.S. and strike worldwide targets in under an hour. The munitions employed are generally the same as those used on conventional aircraft, only they are released from a small, low cost, precision guided missile called a Common Aero Vehicle (CAV). The CAV enables interchangeable use of virtually the entire arsenal of next generation air munitions currently in development at the Air Force's Air Armaments Center. It protects the munitions during hypersonic reentry and dispenses them with the same accuracy

NASA- USAF Reusable Space Launch Development 120 Day Study Industry Day Briefing, Payloads and Sensors Team, January 15-18, 2002, Slide 16

> and effect as if being dropped from aircraft. These munitions are designed to selectively strike surface targets, mobile vehicles, deeply buried bunkers, aircraft in flight, and potentially even bio-terrorism targets requiring Agent Defeat munitions designed to destroy biological weapons.[37]

The "White Paper" also stresses that the CAV makes it easier to deploy force unilaterally:

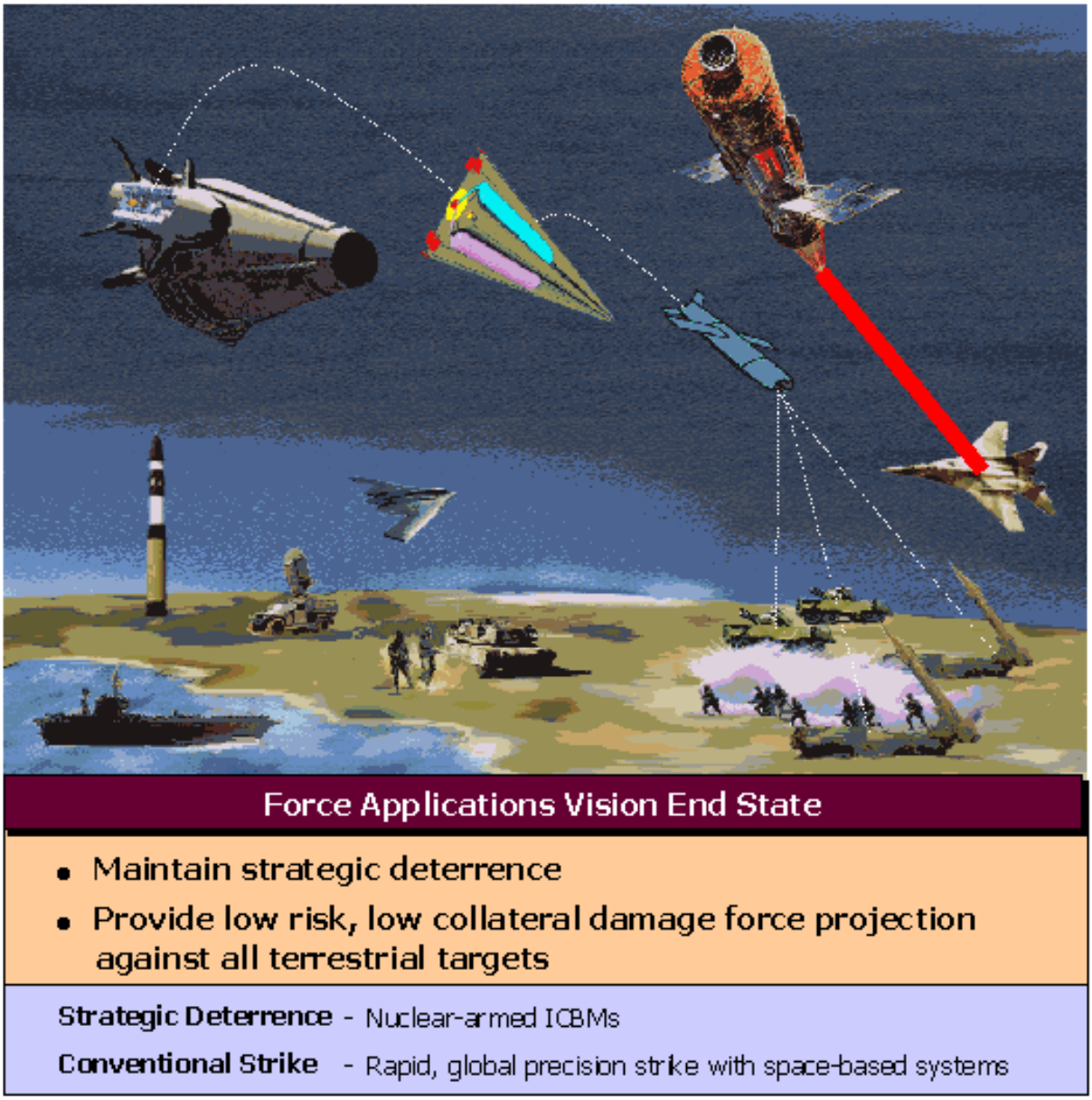
> A key advantage of CAVs is that they reenter controlled airspace only over the target country, and the U.S. need not seek over flight permission from any other countries. Currently there are few potential defenses against munitions delivered by CAVs. Thus, they can be used to strike hard and deeply buried land targets, naval bases and surface combatants, airbases, and military and civil infrastructure.... Military space planes armed with CAVs provide global power projection without the massive logistics tail required when employing conventional airpower overseas—a critical capability for a transformed force.[38]

The initial MSP concept calls for it to be launched from and to land at air bases in the continental United States. When delivering weapons, the Space Plane likely could fly a sub-orbital trajectory, releasing its payload and then landing at another U.S. base.[39] "The operational goal of the SSTO MSP [single stage to orbit military space plane] is to take off on demand from CONUS, and deliver a CAV to any location in the world within an hour."[40] But the Space Plane also could be placed in orbit in a crisis. "Orbiting the earth, a CAV-armed military spaceplane would be ready to precisely strike fixed or mobile WMD and other high value targets within moments of combat identification."[41] It also could place space-based weapons or sensors in orbit.[42]

There are several different technologies under consideration for the MSP. The Single Stage to Orbit approach explored by NASA during the 1990's apparently has been supplanted for the near term by two stage to orbit concepts, which require less of a technology leap from existing booster and space shuttle technology.[43] Also being considered are various air-breathing hypersonic technologies, either for initial acceleration of a space plane in the atmosphere or to power long-range hypersonic aircraft that will operate on the upper fringe of the atmosphere. These would be able to accomplish some or all of the space plane's missions, particularly long range offensive strike.[44] Top Defense Department research and development officials envision a "stepping stone" approach that will produce some useable hardware in the near term, such as a hypersonic missile and a hypersonic "cruiser" for global attack, while building the technology base for reliable, cheaper access to space in the long-run.[45]

The Space Plane, the CAV, and the Bush Administration Military Vision

Despite the technological difficulty and expense of the Space Plane, its multiple missions and the opportunities it provides to develop other militarily useful technologies are likely to sustain the concept for some time to come, particularly in a time when there is little Congressional opposition to military spending of any kind. An Air Force Scientific Advisory Board "red team" assigned to examine Defense Department hypersonic technology proposals noted that "neither the threat nor economic business cases, with or without shared use, justifies a hypersonic system," and



Force Applications capabilities evolve to timely, flexible and precise Global Engagement

"Presently, our only option for prompt, global strike is nuclear intercontinental ballistic missiles (ICBM). AFSPC''s future conventional Force Applications options include: Continental United States (CONUS)-based conventionally armed ballistic missiles, on-orbit systems able to attack terrestrial targets and reusable space operations vehicles with global range. The latter has the triple advantage of ballistic missile-like response times, bomber-like flexibility for in-flight recall and/or retargeting, and CONUS basing. Attaining the Vision end state produces a low risk, low collateral damage force application capability that nearly instantaneously imposes our will on an adversary. We will be able to control the tempo of operations, accelerating and decelerating attacks against all targets at the Joint Force Commander''s (JFC) choosing, while reducing the exposure of our troops and materiel to danger. Near-real-time intelligence data, combined with a global response time of minutes, could change the nature of conventional military deterrence." Air Force Space Command, Strategic Master Plan for FY02 and Beyond, February 9, 2000, section 2.2.4, http://www.spacecom.af.mil/hqafspc/library/AFSPCPAOffice/2000smp.html

that the decision to proceed with such programs is "vision-related." The Scientific Advisory Board concluded that a comprehensive hypersonics plan would be needed if "the Air Force vision of 'controlling and exploiting the full aerospace continuum' is to become reality...."[46]

But with the advent of the Bush Administration, it appears that just such a vision is ascendant. The goal of "full spectrum dominance"[47] that has become the mantra of military doctrine documents over the past decade is being pursued via the development of a wide range of weapons technologies, with a growing emphasis on space systems and the ability to strike targets anywhere on earth quickly from the Continental U.S. or from space. The Bush Administration's 2001 Quadrennial Defense Review announced a policy of "forward deterrence," and emphasized that "[c]apabilities and forces located in the continental United States and in space are a critical element of this new global posture."[48] Portions of the "Defense Planning Guidance" recently leaked to the Los Angeles Times also called for development of military space systems, directed energy weapons, hypersonic missiles, and capabilities that will allow "unwarned" offensive strikes.[49]

The Administration appears to have bought the Air Force Space Command "vision," as set forth in the *Air Force Space Command Strategic Master Plan for FY02 and Beyond*:

> The ability to halt an enemy's operations within hours, minutes, or even seconds, rests with providing a prompt, global, conventional strike capability. The far-term addition of an SOV [space operations vehicle], combined with CAV, will provide warfighting forces with improved and more flexible conventional strike capabilities. Moreover, space-based directed energy weapons systems, such as the SBL [space based laser], will offer US and Allied forces revolutionary air superiority and global attack advantages in speed, range and response time over all terrestrial systems. The SBL capability for rapid global strike against space and airborne targets will give the US a formidable military advantage. The combination of SBL, along with SOV assets delivering the CAV, provides a complete range of prompt, global, conventional strike options to the future.[50]

Both the CAV and the MSP are consistent with the Bush Administration's main "military transformation" goals. They would allow the U.S. to attack quickly anywhere on earth, without risking pilots or requiring exposed, politically problematic forward bases. The multiple roles envisioned for the Space Plane increase the likelihood that some version will be developed and deployed. If it achieves its objective of substantially cheaper and more reliable space launch with rapid turnaround times, the Space Plane would remove hurdles to deploying larger and more complex systems in space, such as space-based components of missile defenses (no longer limited by the now-defunct Anti-Ballistic Missile Treaty) and new networks of surveillance and communications satellites. It also would open the door to the wholesale weaponization of space.

New Weapons, New Dangers

Although neither the CAV or the Military Space Plane would be "space-based weapons" in the sense of weapons permanently deployed in orbit, the addition of new classes of strategic weapons, especially highly accurate and powerful non-nuclear weapons with global range, adds yet another complication to a

looming 21st century arms race. While these systems are feasible extensions of relatively well-understood space and rocket technologies, they still will require enormous technological resources and will be very expensive. They also will derive much of their effectiveness from working in combination with a global grid of surveillance and communications satellites, which will allow these new systems to be rapidly deployed and accurately targeted. Few other states, if any, are likely to be able to develop a comparable global precision strike capability in the foreseeable future. And even if developed and deployed initially for conventional missions, the CAV, alone or along with the Space Plane, apparently would give the U.S. the capability to deploy more maneuverable, accurate, and versatile nuclear re-entry vehicles if it chose to do so.

Particularly if combined with increasingly capable missile defenses, a global precision conventional strike capability may create an exacerbated "use it or lose it" predicament for U.S. adversaries, who may perceive a *conventional* first strike by the U.S. as far more likely in a crisis than a nuclear strike.[51] CAV's delivered by missiles or spaceplanes would augment the already formidable array of long-range, accurate, powerful conventional weapons a U.S. adversary would face in a crisis; including an increasing variety of long-range, fast, stealthy missiles. This perception is strengthened by an overt U.S. doctrine of seeking to destroy an adversary's weapons of mass destruction pre-emptively:

> The United States has long maintained the option of preemptive actions to counter a sufficient threat to our national security. The greater the threat, the greater is the risk of inaction— and the more compelling the case for taking anticipatory action to defend ourselves, even if uncertainty remains as to the time and place of the enemy's attack. To forestall or prevent such hostile acts by our adversaries, the United States will, if necessary, act preemptively. National Security Strategy of the United States of America, September 2002.[52]

Nuclear Weapons in the Age of Global Conventional Strike

The U.S. still plans to retain a strategic nuclear arsenal far larger than is needed to annihilate any country. These nuclear weapons systems also are being constantly modernized, even in the absence of completely "new" warhead designs, and could benefit as well from the improvements in guidance systems and maneuverable re-entry vehicle technology that would result, for example, from efforts to develop conventional intercontinental ballistic missiles. This would result in a more "useable" strategic arsenal consisting of both long-range conventional missiles capable of taking out a wide range of "softer" targets previously assigned to nuclear warheads, and nuclear weapons capable of destroying hard targets like missile silos with reduced yield due to increased accuracy.

In a 2000 paper titled "Nuclear Weapons in the 21st Century," Stephen Younger, then Los Alamos Laboratory Associate Director for Nuclear weapons, explored several options for a "mixed force of long-range conventional and lower-yield nuclear weapons with improved accuracy," noting that if numbers of warheads are significantly reduced, "special consideration might be given to maneuvering reentry vehicles that can deal effectively with enemy defenses."[53] Younger also suggested that lower yield nuclear options should be explored because

> ...[T]he current stockpile may not be credible against some set of potential adversaries. For example, if a national emergency were to develop that involved the imminent use of weapons of mass destruction against American interests, would an adversary consider our threat of a multiwarhead attack by the Peacekeeper ICBM or a Trident SLBM as overkill and hence not a realistic threat? Such a reliance on high-yield strategic weapons could lead to "self-deterrence," a limitation on strategic options, and consequently a lessening of the stabilizing effect of nuclear weapons.[54]

The Bush administration elevated Younger to be Director of the Defense Threat Reduction Agency, a key nuclear weapons and strategic policy position. And similar views now prevail in the government, with the new Nuclear Posture Review calling for "New Triad" that places greater emphasis on long-range precision conventional weapons in the strategic arsenal, and for renewed research on special purpose and lower yield nuclear weapons. The government maintains that the addition of conventional strategic strike capabilities to a large nuclear arsenal will reduce, not increase, the danger of nuclear catastrophe. As explained by Undersecretary of Defense for Policy in Senate testimony earlier this year,

> Within the New Triad, nuclear forces will be integrated with, rather than treated in isolation from, other military capabilities. This creates opportunities for substituting non-nuclear strike capabilities for nuclear forces and defensive systems for offensive means. This does will [sic] not blur the line between nuclear and non-nuclear weapons, but it will reduce the pressures to resort to nuclear weapons by giving U.S. Presidents non-nuclear options to ensure U.S. security.[55]

But the "New Triad" envisioned by the military planners includes far more than nuclear forces and precision conventional weapons. It also includes new space surveillance and command and control systems, missile defenses, and weapons designed to degrade or destroy an adversaries electronic equipment.[56] We are drifting towards a new arms race with more types of weapons that can strike halfway across the planet in hours or minutes, more dependence on electronic systems that operate at speeds beyond human comprehension and that themselves will be the targets of new forms of deception and attack, and more useable nuclear weapons. The likely result will be more nations building armaments rather than the infrastructure and institutions necessary for true human security.

The Perils of Empire

We didn't seek to have a major empire. We didn't seek to be the most powerful country on the planet. It sort of happened to us. Stephen Younger, then Associate Director for Nuclear Weapons, Los Alamos National Laboratory, 1999.[57]

As a global power, the United States has important geopolitical interests around the world.
DoD's new planning construct calls for maintaining regionally tailored forces forward stationed and deployed in Europe, Northeast Asia, the East Asian littoral, and the Middle East/Southwest Asia to assure allies and friends, counter coercion, and deter aggression against the United States, its forces, allies, and friends. U.S. Department of Defense, *Quadrennial Defense Review Report,* 2001.[58]

The push towards technologies that can strike quickly and hard anywhere on earth from space or from bases in the U.S. has increased as the military has grown more concerned about the vulnerability of forward bases and extended lines of transport and communication to missiles and weapons of mass destruction. In its 2001 report *Proliferation: Threat and Response*, the Defense Department stated that

> ...[T]he United States must be prepared to fight and win under conditions where an adversary may use asymmetric means against us —unconventional approaches that avoid or undermine our strengths while exploiting our vulnerabilities. Because of our conventional military dominance, adversaries are likely to use asymmetric means, such as WMD, information operations, or terrorism. Such asymmetric attacks could be used to disrupt the critical logistics pipeline —from its origins in the United States, along sea and air routes, at in-transit refueling and staging bases, to its termination at airfields, seaports, and supply depots in theater —as well as our forces deployed in the field.[59]

Unable to compete directly with the massive, globe girdling U.S. high-tech military machine, potential adversaries instead are likely to concentrate on its weak points. In this regard, it is important to consider the type of "deterrence" states that see themselves as possible targets of U.S. military action are likely to seek. U.S. global capabilities extend far beyond what is needed to defend U.S. territory. They protect U.S. economic and political advantage throughout the world– they are, in essence, the forces of empire. U.S. military strategists plan obsessively for "asymmetric" warfare, but concentrate on technical solutions to problems which at their core are political. At the heart of the imperial relationship lies an "asymmetry" that historically has doomed every imperial military enterprise. An imperial power is, by definition, a foreign power. When it goes to war with societies it seeks to dominate, it must at minimum demoralize or destroy the dominant indigenous political structure, and must somehow control the population as well. Those who oppose imperial powers can succeed by achieving far less ambitious goals: they only have to inflict enough damage to make a particular military intervention politically unsustainable.

There is the additional "asymmetry" that no matter how successful the empire is at portraying those who resist as barbarians in need of a strong civilizing hand, military methods that kill large numbers of civilians inevitably undermine the legitimacy of imperial military action. In military jargon, this is represented as a "sensitivity" to civilian casualties on the part of the U.S. public. This sensitivity is characterized in various, contradictory terms: as an inherent virtue of "democracies," as a temporary "post-Vietnam" weakness of national will that must be overcome. But in the final analysis, it is the consequence of an American empire that never has been fully justified by those who rule to their own people, who may find it difficult to understand how they are being "protected" by sending their sons and daughters to kill poor people on the other side of the world.

The development of U.S. military strategy and technology over the last decade derives in large part from two developments: the end of the Cold War and the spread of the technical wherewithal for weapons of mass destruction and missiles to deliver them. Some states that saw themselves as potential adversaries of the U.S. have been seeking WMD of one kind or another for many years, as a deterrent against the superior military forces of the U.S. and its

regional allies or to counterbalance regional powers. The collapse of the Soviet Union both removed formal or informal security arrangements relied on by some states, and contributed to the rapid ascendance of the U.S. as an unchecked global military power. Some states now find themselves in a position where they must "deter" military action by the United States and its allies by themselves.

With U.S. conventional capabilities far out of reach, missiles with sufficient range to target the rear areas of forward deployed U.S. forces and non-nuclear weapons of mass destruction are seen as a relatively cheap equalizer. Chemical and biological weapons may be military instruments too crude to allow a clear cut victory over a superpower military (or even over an adversary of comparable power, as the Iran-Iraq war demonstrated). But they can vastly complicate the task of maintaining a large military intervention from afar. They make it difficult to obtain forward bases by threatening U.S. allies who might provide them, raise the risk of substantial casualties to U.S. forces themselves, and slow the pace of U.S. military operations if troops have to operate in cumbersome protective gear.

In response, the U.S. has sought the means to detect and destroy WMD and supporting facilities; and defenses designed to protect forward deployed troops, their bases, and host countries against short and medium range missiles. And the military has sought to limit its forward base vulnerabilities by designing "air expeditionary forces" that reduce the logistical support infrastructure needed to support air campaigns, and by relying more heavily on missiles delivered by ships and long-range aircraft. At the same time, the U.S. is seeking to develop nuclear weapons with new, more "discriminate" capabilities.[60] The political and moral "asymmetries" afflicting an imperial power in its foreign wars make retaliation with large Cold War style nuclear weapons for WMD use (or pre-emptive attacks before they can be used) less "credible," so options like accurate, low-yield earth penetrating nuclear weapons are being explored.[61] The next steps are systems like the Space Plane and the Common Aero Vehicle, that can strike quickly with powerful, accurate conventional weapons on the other side of the globe without any forward bases at all. All of these strategies and weapons, of course, are premised on the assumption that the U.S. has the need and the right to deploy overwhelming military force anywhere, even inside other countries.[62]

The likely result of these efforts, however, will be to help create the "worst case" world that Pentagon contingency planners conjured up to keep their weapons acquisition budget lines alive when their Cold War rationale precipitously collapsed. The increased capability these systems could give the U.S. to destroy mobile targets like missile launchers and hard targets like missile silos with conventional weapons in an hour or two, anywhere on earth, may make future efforts to prevent further missile proliferation and to reduce stockpiles of nuclear weapons and other weapons of mass destruction futile.

The Military Space Plane, together with the sub-orbital and orbital weapons it could carry, also could renew interest in systems designed to destroy objects in orbit– either space planes or satellites. The Space Plane itself is seen by the military as a key component in plans for "space superiority," including the deployment of directed energy weapons and satellites that could be used for anti-satellite warfare.[63] With the U.S. possessing an overwhelming advantage in all forms of conventional

weaponry, in space-based systems for their coordination and targeting, and perhaps eventually in missile defenses, other countries may seek to target the "weak links" in high-tech space dependent systems, such as satellites in predictable orbits. And the more successful the effort to reduce the vulnerability of the "front end" of U.S. global expeditionary forces, the more potential adversaries will look for ways to attack the immensely complex U.S. high-tech infrastructure that produces the weapons and coordinates the wars, making the entire planet a potential battlefield.[64] The dilemmas of "deterrence--" an increasingly misleading label for efforts to dominate any imaginable military confrontation anywhere on earth-- not only will remain, they will have grown even more complex and unstable. This endless sequence of countermoves may serve to justify almost any imaginable high-tech military, surveillance, and "security" program, but it does nothing to make ordinary people anywhere more secure.

Caught in the Crossfire: Democracy, Civilian Casualties, and the Temptations of High-Tech Weapons

Weapons designed to "deter" large-scale warfare among advanced industrialized societies also frequently end up getting used in "small" wars with horrific results. The B-52 and other planes designed for nuclear war with Russia rained bombs for years on Vietnam (their Soviet equivalents later did the same to Afghanistan). Cruise missiles, B-1 and B-2 bombers, and global satellite-aided targeting systems whose development began for Cold War strategic warfare have been used repeatedly for intervention throughout the last decade. Anti-aircraft weapons that fire thousands of rounds per minute, developed for use against modern strike aircraft, today are being used to take down dwellings that the Israeli Army suspect housed snipers. The continuing military confrontations among the most heavily armed states in this way intensify warfare, and its terrible direct and indirect effects on civilians, across the entire spectrum of conflict.

Already, the still-undesigned Space Plane is being touted by its advocates as a solution for the intractable difficulties of targeting "terrorists," purportedly providing quick response times that will allow a devastating assault from above before adversaries can slip away.[65] But as we have seen from the pharmaceutical factory in Sudan to the Chinese Embassy in Belgrade to one "wrong" village after another in Afghanistan, although U.S. forces today can hit targets more accurately, they often don't hit the right targets. Target selection is only as good as available intelligence about what is being targeted. Weapons that will be fired from or through space are likely to be used in situations where there is little or no information from ground observers. Target selection will depend on images from space or high-flying aircraft, combined with other types of indirect information.[66] Governments and other sophisticated armed organizations will be well aware of U.S. tactics, and will conceal or disperse military assets of sufficient value to be worth hitting with expensive space systems. U.S. decision-makers will have at their command yet another means to apply enormous "precision" firepower without risk to American troops. And as is always the case, the poor of some distant land will be caught in the middle, "unwarned" until their small part of the world comes to an end...

In addition to those who will be killed due to "targeting errors," many more will die as "collateral damage" in wars that never would have been fought, but for the temptations that

such overwhelming military power brings. Weapons systems having global reach make it easier for a small faction at the top of the Executive Branch of the U.S. government to go to war quickly, without the need to build a broad political consensus. The permanent military mobilization of the past half century already has made it far easier for the executive branch to go to war against all but the most powerful states– there is no need to retool factories or greatly increase the number of people in uniform. The development of technologically superior aircraft and long-range missiles have made it possible to inflict frightful damage with greatly reduced risk to U.S. combatants. But to sustain a large military operation at a great distance, the U.S. still must mobilize a large and expensive system of logistical support, and face the risk that if a war went badly those bases and lines of communication could be vulnerable. A substantial capacity to strike with conventional weapons from or through space would remove some of these impediments, and with them the set of decisions that must be made, the concrete manifestations before the fact of war's gravity and cost, and the time to reflect and discuss that still are unavoidable on the road to war. Whether used for "covert" strikes that the public (and even Congress) only finds out about later, or to wreak spectacular, nearly instantaneous vengeance, the availability of conventional weapons deliverable world wide in hours or minutes may remove the last vestiges of democracy from decisions of war and peace.

The ability to wage war without broad public support, however, is viewed by influential military thinkers as a positive thing, to be pursued by the development of technology appropriate to the task. A recent RAND study for the Air Force stated that

> Most U.S. military operations for the foreseeable future will be undertaken with limited or less-than-majority American public support. Technological advances that expand the USAF's effectiveness will help it play an important role overcoming possible domestic constraints on the use of force such as casualty sensitivity.[67]

Among the "examples of technological advances that might provide the USAF with capabilities that will help overcome or alleviate U.S. domestic constraints" identified by the RAND study were "[h]ighly effective unmanned weapons, such as cheap standoff munitions and space-based assets, that pose no risk of U.S. casualties."[68]

Although the Common Aero Vehicle (CAV) and the Space Plane have powerful backers, they still are programs that are early in the development process, and that can be stopped. If they proceed much further, however, deployment in some form will become more difficult to prevent. The CAV, based as it is on current missile and reentry vehicle technologies, will benefit from other ongoing efforts to modernize the strategic missile force. Improvements in reentry vehicle technologies and guidance systems in particular will make the CAV less of a leap as time goes on. The Military Space Plane, in contrast, is a relatively high-risk program. But so long as military programs that will benefit significantly from less expensive and more reliable space launch continue, there will be pressure to build the Space Plane or something much like it. Missile defenses and related space-based surveillance satellites, along with other multi-billion dollar upgrades in space-based military sensing and communication systems, will both provide demand for cheaper and more frequent space launches, and will

drive the development of a wide range of basic space technologies– light structures, radiation-hardened electronics, rocket propulsion, and in-space power generation. And increased dependence on all of these systems will heighten demand for yet another layer of space-based hardware to protect them.[69] All of this also will provide technology development and infrastructure that will make deployment of weapons platforms in space easier. We are on the verge of a new, powerful segment of the military-industrial complex, on the order of the nuclear weapons complex that dominated the arms racing dynamic of the Cold War.

Despite the unpromising political climate within the United States, it is imperative that those who favor peace address themselves seriously first to the control and eventually to the prohibition of weapons operating through and from space. Further, these efforts are more likely to be successful if they are part of a broader movement that addresses the causes of international conflict rather than just the instruments of warfare, and that challenges the legitimacy of an enormous, permanent military whose mission is global dominance.

The Road Ahead: Arms Control and Social Change

Two forms of arms limitation that have merit are a "Prevention of an Arms Race in Outer Space" Treaty and a treaty aimed at abolishing long-range ballistic missiles in the long term, and while in the short term stopping their further development. A number of countries, including Russia and China, recently have put forward proposals for a treaty that would ban the placement of weapons in space and the use of force against objects in space.[70] Such a treaty would prohibit a number of the weapons systems currently being contemplated by the United States, including space-based ballistic missile defense platforms like the space based laser (which also could be used for other offensive purposes) and various proposed anti-satellite technologies, both ground and space-based. It would not, however, ban new types of long-range missiles or missile payloads, like the Common Aero Vehicle (CAV) or other types of maneuvering re-entry vehicles. It also would not prohibit a Military Space Plane, nor, perhaps-- unless its definition of placing weapons "in space" were made explicitly restrictive-- the temporary deployment of weapons-carrying Space Planes in orbit during a crisis.

There have been a number of proposals for a second type of treaty that would address some of these issues by controlling and eventually eliminating long-range ballistic missiles. Many of these proposals have included as a starting point an immediate ban on the flight testing of ballistic missiles, a measure that would halt development of particularly destabilizing systems like the CAV and other types of maneuvering reentry vehicles. Ideally, a missile flight test ban and a framework for reductions in long-range missiles should include a prohibition on missile defense tests. An effective ban on offensive missile testing would do much to eliminate the threat that missile defenses supposedly will defend against, while continuing development of missile defenses could make substantial reductions in existing long-range missiles difficult to achieve.[71]

Working for far-reaching disarmament measures like these, despite their dismal short-term prospects, is worthwhile because they make sense, and if implemented could have a lasting effect. They hold more promise for progress towards disarmament than the typical

arms control treaties of the last half-century, which served primarily to maintain status quo relationships among the most powerful states, and their advantage over everyone else, while marginally reducing the chances that they would destroy each other, and the rest of the world along with them. Treaties that prohibit the testing of high-tech weapons are of particular value, because they are an immediate disincentive to investment in further weapons development.[72]

Treaties that aim to prohibit entire classes of military systems and arenas of confrontation hold out some hope of first slowing the growth and then beginning to disassemble the vast military-industrial complex, particularly in the U.S., but also elsewhere, and hence eroding its immense political and economic power. Any narrower forms of arms control are likely to fall victim, sooner or later, to pressure for more military technology, more sales, and more political power. This has, in essence, been the fate of the entire edifice of Cold War arms control, and of the ABM treaty in particular, which were brought down not by chance but as a result of a large-scale, sustained campaign by U.S. arms makers, their allies in the military, and their political representatives.[73]

To be effective, furthermore, the control of long-range missiles and space weapons must be clearly understood from the outset as part of broader efforts including first the withdrawal of military forces to home territories, and eventually the elimination of all forces with global reach. Otherwise, even broad initiatives like a long-range missile ban only would expand the advantage in other power projection forces possessed by the U.S., allowing it to overpower existing "asymmetric" threats even as the military and the arms makers gather strength for another round of treaty busting.[74] These facts, evident to most people outside the United States, are likely to doom such initiatives before they can begin. Without a substantial pullback by the U.S. from its aggressive, forward-based global military stance, arms control progress of any kind is unlikely.

Current mainstream discussion of proposals for control of weapons in space reveals how much political conditions must be changed before significant progress is likely to be possible. Some of the more thoughtful and concrete proposals for control of space weaponization, for example, accept some sort of U.S. ballistic missile defenses as a *fait accompli*.[75] The potential for incremental increases in force projection through space represented by programs like the Space Plane, research in air-breathing hypersonic technologies that could lead to aerospace vehicles with global reach operating on the margin of space, and conventional ICBM's is largely absent from discussion of space arms control proposals. Such technologies are relevant to the problem of controlling space weaponization not only because they themselves increase capabilities to project force through or from space, but because their development provides technology base, infrastructure, and a heavily funded political base in both the military and the arms industry for the eventual development and deployment of orbital weapons systems.

The main task of arms control professionals is to formulate measures that have some realistic chance of adoption by states in the foreseeable future. But, in order to build the social movements that will be necessary to bring about
real peace, real justice, and a livable future, ordinary people must look elsewhere for analysis, for inspiration, for an idea of what

must be changed and how to change it.[76] They must ask for what is right, not for what is possible today. The task of social movements is to change the limits of the possible. This will require a real peace movement, one that addresses the causes of war as well as weapons and their effects. The necessary social transformation can not begin unless its possibility is acknowledged, and its possibility can not be taken seriously unless we can imagine a world no longer ordered primarily by the threat and exercise of overwhelming military force.

By Andrew M. Lichterman

Notes

1. Immediately before his appointment as Secretary of Defense, Rumsfeld chaired the congressionally mandated Commission to Assess United States National Security Space Management and Organization, which enthusiastically endorsed the expansion of U.S. military capabilities in space. See generally *Report of the Commission to Assess United States National Security Space Management and Organization*, Pursuant to Public Law 106-65, January 11, 2001, http://www.defenselink.mil/pubs/space20010111.html

2. Statement of the Honorable Douglas J. Feith, Undersecretary of Defense for Policy Senate Armed Services Hearing on the Nuclear Posture Review February 14, 2002, p.10.

3. National Security Space Architect, *National Security Space Roadmap* (1999), "Conventional Ballistic Missile (CBM) with Maneuverable Non-Nuclear Reentry Vehicle (MNNRV)," available at http://www.wslfweb.org/docs/roadmap/irm/internet/forceapp/init/html/cbmmnn.htm (obtained by Western States Legal Foundation via the Freedom of Information Act).

4. One proposed version of the MNNRV was described as follows:

"The modified non-nuclear RV has limited controllability through the use of moving mass control for center of gravity control (gross) and jet reaction for fine control. Impact velocities could be as high as 9,000 fps (however the vehicle would likely be slowed to 4,000 to 6,000 fps), and the control system allows a nearly vertical impact angle. Accuracy would be achieved with a Global Positioning System (GPS) integrated inertial measuring unit (IMU) along with the jet reaction control system which can maneuver the vehicle around the center of gravity to allow the vehicle to fly at any commanded angle of attack or yaw. GPS updates are acquired exoatmospherically and are reacquired on late reentry after GPS blackout has occurred. The GPS signal is acquired by several antennas likely located on the aft end of the vehicle to reduce the effects of plasma and heating. GPS-aided guidance could provide an accuracy of less than 10 meters CEP (circular error probable)." U.S. Air Force, *1997 Space Force Application Mission Area Development Plan*, p.32 (obtained in part by Western States Legal Foundation via the Freedom of Information Act).

5. National Security Space Architect, *National Security Space Roadmap* (1999), "Conventional Ballistic Missile (CBM) with Common Aero-Vehicle (CAV)" available at http://www.wslfweb.org/docs/roadmap/irm/internet/forceapp/init/html/cbmcav.htm (obtained by Western States Legal Foundation via the Freedom of Information Act).

6. U.S. Air Force, *1997 Space Force Application Mission Area Development Plan*, p.35 (obtained in part by Western States Legal Foundation via the Freedom of Information Act).

7. *Id.*

8. See *Defense Science Board 1998 Summer Study: Joint Operations Superiority in the 21st Century*, Vol. II, "Supporting Reports," p. 3. http://www.acq.osd.mil/dsb/josup2.pdf That study also concluded that conventional ballistic missiles, including submarine-launched missiles, carrying either kinetic kill rods or explosive penetrators

would be relatively easy to deploy:

> The enabling technologies are low risk. The launchers use basic missile technology with standard GPS approaches for the warheads. The conventional penetrator warhead delivery vehicle uses existing reentry body designs and the technology is well in hand to achieve the impact velocities and location accuracies for hard target kills. *Id*.

9. U.S. military planners recognize to some degree the potential for catastrophic confusion conventional intercontinental ballistic missiles would present. This is not seen as a fundamental flaw in the CONOPS (military jargon for "concept of operations"), but rather as just another technological and perhaps political hurdle to be overcome. The *National Security Space Roadmap* stated that

> The Conventional Ballistic Missile (CBM) with Maneuverable Non-Nuclear Reentry Vehicle (MNNRV) supports the Space Force Application mission to conduct global prompt strikes through and from space against terrestrial targets. The MNNRV system would likely be based on the Eastern or Western ranges (ER and WR) to insure treaty compliance with the nuclear ICBMs, and to limit collateral damage from falling boosters. In addition, these systems could be open to inspectors from various countries to provide validity to US claims that they are not nuclear. Additional measures such as introducing an inert material in the propellant which will help distinguish its signature from other missiles could be incorporated. National Security Space Architect, *National Security Space Roadmap* (1999), available at http://www.wslfweb.org/docs/roadmap/irm/internet/forceapp/init/html/cbmmnn.htm (obtained by Western States Legal Foundation via the Freedom of Information Act).

10. *Air Force Space Command Strategic Master Plan for FY02 and Beyond*, February 9, 2000, section 6.2.2, http://www.spacecom.af.mil/hqafspc/library/AFSPCPAOffice/2000smp.html

The Air Force SAB Hypersonics Report described the Common Aero Vehicle program as follows:

> Boeing and Lockheed Martin have been participating in Air Force–sponsored studies of advanced maneuvering reentry vehicles, often referred to as CAVs.... These vehicles with high lift-to-drag ratios have no primary propulsion, but have movable surfaces to provide high cross-range capability. They are designed to carry conventional weapons (small bombs, submunitions, or penetrators) and can be deployed from conventional ICBMs or a hypersonic cruise vehicle operating at high altitude. United States Air Force Scientific Advisory Board, *Report on Why and Whither Hypersonics Research in the US Air Force*, December 2000, p.35 http://www.sab.hq.af.mil/archives/reports/2000/Hypersonics-Report.PDF (Hereafter Air Force SAB Hypersonics Report).

11. National Security Space Architect, National Security Space Roadmap (1999), "Common Aero-Vehicle (CAV) for Military Spaceplane (MSP)," available at http://www.wslfweb.org/docs/roadmap/irm/internet/forceapp/init/html/cavmsp.htm (obtained by Western States Legal Foundation via the Freedom of Information Act).

12. *Report on Why and Whither Hypersonics Research in the US Air Force*, December 2000, p.35 http://www.sab.hq.af.mil/archives/reports/2000/Hypersonics-Report.PDF pp. 50-51.

13. "Basic CAV designs are relatively mature technology and have been flight tested successfully in several Ballistic Missile Organization/Advanced Strategic Missile Systems (BMO/ASMS) programs." U.S. Air Force, *1997 Space Force Application Mission Area Development Plan*, p.49.

14. "To enable the United States to project power through space to any region in hours, accelerate research and development to develop the Space Maneuver Vehicle (SMV) as a sortie platform and the Common Aerospace Vehicle (CAV) as its primary payload." *Transformation Study Report, Executive Summary, Transforming Military Operational Capabilities*, Prepared for the Secretary of Defense April 27, 2001 p.27.

http://www.defenselink.mil/news/Jun2001/d20010621transexec.pdf

15. RDT& E Budget Item Justification Sheet (R- 2 Exhibit), Research, Development, Test & Evaluation, Defense-wide, Technical Studies, Support & Analysis PE 0605104D8Z, February 2002 p.19. http://www.dtic.mil/descriptivesum/Y2003/OSD/0605104D8Z.pdf

16. The recent joint NASA–Air Force "One Team" 120 day study on reuseable launch vehicles listed as a mission requirement for the military version the capability to deliver "150 CAVs in 2-3 Days." NASA- USAF Reusable Space Launch Development 120 Day Study Industry Day Briefing, January 17, 2002, Requirements and Operations Team Briefing Slides, Slide 7, "requirements Matrix: General Mission." Downloaded from http://www.losangeles.af.mil/smc/xr/public/req_team_industry_day.ppt, now available at http://www.wslfweb.org/docs/msp/req_team_industry_day.ppt

17. "Schriever Legacy Carries on in XR," *The XR Report, A Quarterly Newsletter of the Developmental Planning Directorate, SMC*, Vol. 3 no.2, Jan-Mar 2001.

18. *Space Force Application Mission Area Development Plan, p.* 32. A gravity bomb earth penetrator version of the B61 nuclear bomb, the B61-11, was developed and deployed without underground nuclear testing by modifying an existing B61 design in the mid-1990's. See "The Birth of a New Bomb: Shades of Dr. Strangelove! Will We Learn to Love the B61-11?," Greg Mello, The Washington Post, June 1, 1997, p. C-1. ("Mello") See also "New bomb, no Mission" by Greg Mello in The Bulletin of the Atomic Scientists, May/June 1997.

19. *Space Force Application Mission Area Development Plan, p.* 32..

20. U.S. Air Force, *1997 Space Force Application Mission Area Development Plan,* p.38

21. *Id.* at pp. 39-40

22. The *Space Force Application Mission Area Development Plan* directly acknowledged these political difficulties. The nuclear CAV concept was rejected after the document was complete but before it was issued, resulting in a statement on its cover that

> References to using the Common Aero Vehicle (CAV) to deliver nuclear weapons should be disregarded. AFSPC is no longer considering using the CAV to deliver nuclear weapons. Where CAV is mentioned for nuclear weapons, the term Maneuvering Reentry Vehicle (MaRV) should be used. (Refer to the 1996 development plan.) These changes reflect current political realities and were brought to light after printing.

23. See Thomas E. Ricks and Vernon Loeb, "Bush Developing Military Policy Of Striking First: New Doctrine Addresses Terrorism," *The Washington Post*, June 10, 2002; Page A1.

24. Nuclear Posture Review, pp. 34-35, provided in "Nuclear Posture Review Excerpts," Globalsecurity.org, at http://www.globalsecurity.org/wmd/library/policy/dod/npr.htm For a more detailed analysis of the Nuclear Posture Review and current U.S. nuclear weapons policies and their relationship to other high-tech weapons programs, see Andrew Lichterman and Jacqueline Cabasso, *The Shape of Things to Come: The Nuclear Posture Review, Missile Defense, and the Dangers of a New Arms Race*, WSLF Special Report, April 2002, http://www.wslfweb.org/docs/shape.pdf For additional information from a variety of sources about the Nuclear Posture Review, see the WSLF NPR information page at http://www.wslfweb.org/nukes/npr.htm

25. Nuclear Posture Review, p. 41, provided in "Nuclear Posture Review Excerpts," Globalsecurity.org, at http://www.globalsecurity.org/wmd/library/policy/dod/npr.htm

26. *Space Force Application Mission Area Development Plan* at 45.

27. *Id.* at 39.

28. "For destruction of more deeply buried facilities, DoD and DoE are studying the sensitivities and synergies of nuclear weapons yield, penetration, accuracy, and tactics." *Report to Congress on the Defeat of Hard and Deeply Buried Targets*, Submitted by the Secretary of Defense in Conjunction with the Secretary of Energy in response to Section 1044 of the Floyd D. Spence National Defense Authorization Act for the Year 2001, PL 106-398, July 2001, p.21. The unclassified content of the report can be found at http://www.nukewatch.org/nwd/HiRes_Report_to_Congress_on_the_Defeat.pdf

See also *Looking for New Ways to Use Nuclear Weapons: U.S. Counterproliferation Programs, Weapons Effects Research, and "Mini-Nuke" Development*, WSLF Information Bulletin, Winter 2000, available at http://www.wslfweb.org/docs/mininuke.pdf

29. See Statement of The Honorable Ronald M. Sega, Director, Defense Research and Engineering, U.S. Department of Defense, Before the Commission on the Future of the US Aerospace Industry, May 14, 2002 http://www.aerospacecommission.gov/051402testimony/sega.shtml

30. " 'National Aerospace Initiative" Pushes Dual-Use Technology," *Aviation Week & Space Technology*, May 20, 2002, p.32

31. See generally National Aeronautics and Space Administration, *Introduction to NASA's Integrated Space Transportation Plan And Space Launch Initiative*, May 17, 2001 http://www.spacetransportation.com/SLIfinal1.PDF

32. NASA- USAF Reusable Space Launch Development 120 Day Study Industry Day Briefing, January 17, 2002, Slide 2, downloaded from http://www.losangeles.af.mil/smc/xr/public/one.011_industry_day.ppt, now available at http://www.wslfweb.org/docs/msp/one.011_industry_day.ppt

33. See Estimate #26, "Budget Amendment: Department of Justice and the National Aeronautics and Space Administration--11/13/02," http://a257.g.akamaitech.net/7/257/2422/14nov20020950/www.gpo.gov/usbudget/fy2003/pdf/26budamend.pdf

34. *Id.* slide 9.

35. NASA- USAF Reusable Space Launch Development 120 Day Study Industry Day Briefing, Payloads and Sensors Team, January 15-18, 2002, slide 21. Downloaded from http://www.losangeles.af.mil/smc/xr/public/p_and_s_industry_day.ppt, now available at http://www.wslfweb.org/docs/msp/p_and_s_industry_day.ppt

36. NASA- USAF Reusable Space Launch Development 120 Day Study Industry Day Briefing, Payloads and Sensors Team, January 15-18, 2002, downloaded from http://www.losangeles.af.mil/smc/xr/public/p_and_s_industry_day.ppt, now available at http://www.wslfweb.org/docs/msp/p_and_s_industry_day.ppt

37. "The Military Space Plane: Providing Transformational and Responsive Global Precision Striking Power: A White Paper on the Operational Utility of a Military Spaceplane in the Emerging 21st Century International Security Environment," (draft), Proposed by members of ONE TEAM in Conjunction With the 120 Day Reusable Launch Vehicle Study, January 2002, p.12 (hereafter Space Plane White Paper). Downloaded from http://www.losangeles.af.mil/smc/xr/public/military_spaceplace_utility.doc, now available at http://www.wslfweb.org/docs/msp/military_spaceplace_utility.doc This paper was part of the "read ahead material" for the 120 day study.

38. *Id.*

39. U.S. Air Force, *1997 Space Force Application Mission Area Development Plan*, p.60 et seq.

40. *Id.* p. 61

41. Space Plane White Paper, p. 13.

42. "The SSTO MSP could conduct multiple missions including surveillance and reconnaissance, space control, and space force applications. For the SFA [space force application] role, the SSTO MSP could be used to place space based weapons on orbit, or actually deliver the weapons against a target. The procedure for each mission is tailored to the specific objective, and the payload contents are selected accordingly. Different weapons can be loaded to accomplish different missions." U.S. Air Force, 1997 Space Force Application Mission Area Development Plan, p.62.

43. See Bill Sweetman, ."Space Giants Step Up Efforts to Win Low-Cost Launch Race."Jane 's International Defense Review 33 (March 2000), pp.30-35.

44. See generally Air Force SAB Hypersonics Report.

45. See Dr. Ron Sega, Director, Defense Research and Engineering, Slide Presentation, "Interoperability, Technology, and Transformation," National Defense Industrial Association 2002 DoD Interoperability Conference, Mar 26, 2002, slide 13 http://www.dtic.mil/ndia/2002interop/sega.pdf.

The Air Force Scientific Advisory Board also noted that the pursuit of reliable space launch via a broad hypersonic technology research program could result in a variety of other weapons-useable technologies:

> Several potentially attractive outgrowths will be available during the course of the recommended program. These system concepts do not in themselves justify the entire investment required for an airbreathing hypersonic program, but given that the investment for space launch has been made, their development may be reasonable. Three such concepts have been identified:
>
> 1. A long-range hypersonic missile that has shown merit in global wargames
> 2. An RLV-derived global bomber that provides both long range and fast response
> 3. A series of technologies drawing on the plasma associated with hypersonic flight to provide high-power directed-energy systems, better aerodynamic performance, and/or survivability enhancements. Air Force SAB Hypersonics Report, p. vii

46. *Id.*, at p.viii.

47. See generally, for example, U.S. Joint Chiefs of Staff, *Joint Vision 2020*, http://www.dtic.mil/jv2020/jvpub2.htm U.S. Space Command, *Long Range Plan: Implementing USSPACECOM Vision for 2020* (1998), Chapter 2 http://www.spacecom.mil/LRP/TOC.htm

48. U.S. Department of Defense, *Quadrennial Defense Review Report*, September 30, 2001, p.26.

49. See John Hendren, "High-Tech Strategy Guides Pentagon Plan," *Los Angeles Times*, July 13, 2002, and William Arkin, "The Best Defense," *Los Angeles Times*, July 14, 2002.

50. .Air Force Space Command, *Strategic Master Plan for FY02 and Beyond*, February 9, 2000, section 6.2.3, http://www.spacecom.af.mil/hqafspc/library/AFSPCPAOffice/2000smp.html

51. For Russia, with its large and well-protected nuclear arsenal, this is not an immediate concern, but it nonetheless already has begun to attract attention. Eugene Miasnakov of Center for Arms Control, Energy and Environmental Studies, Moscow Institute of Physics and Technology has done a preliminary analysis of the strategic potential of U.S.

precision-guided conventional weapons; a slide presentation of this work, "Counterforce Potential Of Conventional Precision Guided Weapons," can be found at http://www.armscontrol.ru/start/publications/pgm/Chicago-web_files/frame.htm For adversaries will less extensive and sophisticated WMD arsenals, however, the "use it or use it" dilemma in a regional crisis is likely to be more acute.

52. At p.15 (pdf version).

53. Stephen M. Younger, *Nuclear Weapons in the 21st Century*, Los Alamos National Laboratory, June 2000, LAUR-00-2850, p.12, p.14.

54. *Id.*, p.13

55. Statement of the Honorable Douglas J. Feith, Undersecretary of Defense for Policy Senate Armed Services Hearing on the Nuclear Posture Review February 14, 2002, p.5

56. For critical commentary on the Nuclear Posture Review, see sources cited above at note 17.

57. Stephen Younger, Video transcript, Los Alamos National Laboratory "Security Immersion Workshop," June 21, 1999. Video obtained by the Los Alamos Study Study Group, Santa Fe, NM, www.lasg.org

58. U.S. Department of Defense, *Quadrennial Defense Review Report,* September 30, 2001, p.20.

59. U.S. Department of Defense, Office of the Secretary of Defense, *Proliferation: Threat and Response* (January 2001) p.77

60. A 1999 Department of Defense planning document identified as a priority the ability "to provide national leaders with improved options by increasing the responsiveness of strategic forces and developing more discriminate options, as done most recently with the introduction of the B61–11 earth-penetrating weapons." U.S. Department of Defense, Deputy Under Secretary of Defense (Science and Technology), *Defense Technology Area Plan,* (2000), p.XI-7, obtained by Western States Legal Foundation under the Freedom of Information Act. Full document available at http://www.wslfweb.org/docs/dstp2000/dtappdf/contents.pdf

61. For an overview of U.S. research on more useable nuclear weapons, see *Looking for New Ways to Use Nuclear Weapons: U.S. Counterproliferation Programs, Weapons Effects Research, and "Mini-Nuke" Development,* WSLF Information Bulletin, Winter 2000, available at http://www.wslfweb.org/docs/mininuke.pdf

62. An extreme version of this kind of thinking can be found in a recent speech by the Chief of Naval Operations, who claims that "homeland security" justifies forward deployed forces that can attack deep inside other countries. What this really means, of course, is that we have to be able to protect our invasion forces operating in other people's "homelands:"

> To make sure this is put in the right context, think back a few years when the words that we used were almost totally defensive when defining ourselves. I want us to think much grander than that. I don't want this to be thought of in terms of defending just ourselves.
>
> What Sea Shield does is extend homeland security to the fullest extent with forward deployed forces, buying time and buying space for the detection and tracking of threats headed toward our country....
>
> As we look to the future, Sea Shield's littoral control capabilities will build upon a rich mix of manned and unmanned systems on, over, and below the sea. This combination of platforms, sensors, and weapons will assure access and provide the foundation of battlespace dominance.

> Perhaps the most radical change embedded in Sea Shield will be the ability to project defensive firepower deep over land. New technologies will allow sea based missiles to engage enemy air targets far over the horizon, before they can threaten joint and coalition forces operating ashore. Admiral Vern Clark , Remarks as delivered "SEA POWER 21: Operational Concepts for a New Era," Current Strategy Forum , Naval War College, Newport, RI June 12, 2002 https://ucso2.hq.navy.mil/n6/webdoc01.nsf/(vwLookup)/9F890504AEC4B4B885256BE500745139?OpenDocument&Return=/n6/webdoc01.nsf/(vwWebPage)/N6.htm?OpenDocument&Expand=6#cat6

63. See generally NASA- USAF Reusable Space Launch Development 120 Day Study Industry Day Briefing, January 17, 2002, downloaded from http://www.losangeles.af.mil/smc/xr/public/one.011_industry_day.ppt, now available at http://www.wslfweb.org/docs/msp/one.011_industry_day.ppt

64. Already, this possibility is becoming a focus of military concern, spawning a new area of doctrine– "critical infrastructure protection"– and another potential profit center for military contractors. For a sampling of military officials framing the new threats and the contractors repackaging their wares to meet them, see the presentations from the National Defense Industrial Association June 2002 Security Division Symposium & Exhibition collected at http://www.dtic.mil/ndia/2002security/index.html.

65. "The marriage of today's precision weapons, new deep earth penetrators, and the responsive global reach of spaceplanes ensure our ability to kill future terrorists if we know where they are. With such responsiveness, even fleeting intelligence can be acted on with a good chance of success. As the military spaceplane shrinks the U.S. decision-to-action loop, the terrorist is forced onto the defensive and must move to simply survive. Essentially, terrorism is deterred with terrifying responsiveness—this is the effect of coercive spacepower." Space Plane White Paper, p. 13

66. Regarding civilian deaths from aerial bombing in the Afghanistan campaign, see Dexter Filkins, "Flaws in U.S. Air War Left Hundreds of Civilians Dead," *The New York Times* (Web edition), July 21, 2002, and Carl Conetta, "Operation Enduring Freedom: Why a Higher Rate of Civilian Bombing Casualties," Project on Defense Alternatives, Briefing Report #11, January 18, 2002 http://www.comw.org/pda/0201oef.html. Connetta, in a careful analysis of media reports of civilian deaths, suggests that the combination of rapidly planned strikes and lack of reliable, on-the-ground intelligence-- the type of circumstances in which "global strike" weapons like the Space Plane and the Common Aero Vehicle are likely-- to be used may have contributed to a high rate of civilian casualties.

67. D. L. Byman, M. C. Waxman, E. V. Larson, *Air Power as a Coercive Instrument*, Rand Corporation, 1999, p.132.

68. *Id*.

69. "An increased dependence upon space capabilities may lead to increased vulnerabilities. As space systems become lucrative military targets, there will be a critical need to control the space medium to ensure US dominance on future battlefields. Robust capabilities to ensure space superiority must be developed--just as they have been for land, sea, and air." United States Space Command, *Vision for 2020*, p. 7 http://www.spacecom.mil/visbook.pdf

70. See "Working Paper Presented by the Delegations of China, the Russian Federation, Vietnam, Indonesia, Belarus, Zimbabwe and Syria: Possible Elements for a Future International Legal Agreement on the Prevention of the Deployment of Weapons in Outer Space, the Threat or Use of Force Against Outer Space Objects," 27 June 2002, available at http://www.reachingcriticalwill.org/cd/speeches02/chiruswp_062702cd.html For additional resources on this topic see Reaching Critical Will Web Resources on Prevention of an Arms Race in Outer Space (PAROS) at the United Nations, http://www.reachingcriticalwill.org/paros/parosindex.html

71. For an overview of ballistic missile control proposals and an argument for their revival, see A. Lichterman, Z.Mian, M.V. Ramana, and J. Scheffran, *Beyond Missile Defense*, International Network of Engineers and Scientists Against Proliferation and Western States Legal Foundation Joint Working Paper, January, 2002,

http://wslfweb/org/docs/missilecontrol.pdf

72. For more on this point, see Marek Thee, "Military Technology: a Driving Force Behind the Arms Race," in Hans Gunter Brauch, ed., *Military Technology, Armament Dynamics and Disarmament: ABC Weapons, Military Use of Nuclear Energy and of Outer Space and Implications for International Law,* (St. Martin's Press, New York: 1989), pp.39-64, at 56 et seq.

73. The military is by no means a passive actor in U.S. foreign policy. An internal Navy newsletter noted that

> We are continually defending one of the foundations of our seapower, freedom of the seas, against legal and operational constraints and restrictions on U.S. naval forces. In so doing, the U.S. Navy has become an active presence on the world's backstage, molding and influencing the policies, agreements and treaties that support the ships, submarines and aircraft that are forward, on center stage. In another recent example, our office was in frequent contact with Joint Staff representatives at the Nuclear Non-Proliferation Treaty (NPT) Review Conference at the UN in New York in May. Our action officers ultimately had a direct impact on shaping language for a final "way ahead" document that protected U.S. policy and yet was acceptable by all nations attending this highly publicized multilateral arms control forum. *SPI [Strategy, Policy, and Intelligence] News and Notes* Issue No. 5, August 2000, a publication of U.S. Navy Plans, Policy and Operations (N3/N5))

For information on the intimate relationships among defense contractors, legislators, and executive branch officials, and anti-arms control think tanks and lobbying groups, see Michelle Ciarrocca and William D. Hartung, *Axis Of Influence: Behind the Bush Administration's Missile Defense Revival*, *op cit.*, and William D. Hartung, with Jonathan Reingold, *About Face: The Role of the Arms Lobby In the Bush Administration's Radical Reversal of Two Decades of U.S. Nuclear Policy*, World Policy Institute, May 2002, http://www.worldpolicy.org/projects/arms/reports/reportaboutface.html

74. Military Space weapons advocates already are thinking about the dangers posed to their agenda by possible space treaties. The Rumsfeld-led Space Commission argued that we must protect a status quo in which "[t]here is no blanket prohibition in international law on placing or using weapons in space, applying force from space to earth or conducting military operations in and through space," warning that "[t]he U.S. must be cautious of agreements intended for one purpose that, when added to a larger web of treaties or regulations, may have the unintended consequences of restricting future activities in space." *Report of the Commission to Assess United States National Security Space Management and Organization*, Pursuant to Public Law 106-65, January 11, 2001,p.17.

75. See, for example, Philip E. Coyle and John B. Rhinelander, "Drawing the Line: The Path to Controlling Weapons in Space," and *Disarmament Diplomacy*, No.66 (September 2002), pp.3-7; and James Clay Moltz, "Breaking the Deadlock on Space Arms Control," *Arms Control Today*, Vol.32 no.3 (April 2002), pp.3-9.

76. For the author's views on the kind of social movement organizing needed for progress on disarmament, see Andrew M. Lichterman, " Some Thoughts about the Path to Abolition of Nuclear Weapons and Strategies for Organizing in the United States," Western States Legal Foundation Working Paper No.1, 1999, http://www.wslfweb.org/docs/wp1.pdf and "Up from the Concrete: Making Connections and Building Coalitions for a U.S. Movement to Abolish Nuclear Weapons," Western States Legal Foundation Working Paper No.2, 2000, http://www.wslfweb.org/docs/wp2.pdf