UNITED STATES

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Two decades after the end of the Cold War, the United States continues to deploy nuclear forces of extraordinary size and power. Thousands of nuclear weapons remain available for use, with enough ready for launch in minutes to destroy any country on earth, at the same time doing irreparable harm to the global environment. These weapons have been maintained since the middle of the twentieth century by a vast complex of laboratories, factories, and test facilities spread across the United States. This complex, although significantly smaller now than it was when it produced and maintained tens of thousands of nuclear weapons amidst a frenzied Cold War arms competition, is being modernized to provide the capacity to maintain existing nuclear weapons and to build new ones into the middle of the twenty-first century.

The President now in office has proclaimed his commitment to nuclear disarmament, but also has made far more concrete policy and budget commitments to the array of institutions that sustain and are sustained by a large and essentially permanent nuclear arsenal. In the broader political realm, crude fear-based narratives dominate mass media discourse about issues of war, peace, and the military, while discourses within the fora of government and amongst the organizations that seek to influence them is limited to adjustments at the margins. All this takes place within a status quo vigorously defended by constellations of large organizations grown extraordinarily wealthy and powerful in a polity where wealth and power have grown increasingly polarized. The military-industrial complex remains one of the most significant such constellations, with economic power equal to any other and a level of legitimacy that surpasses most in a political landscape where most institutions both public and private are widely seen as corrupt. There is little in the way of a disarmament "movement". The nascent political movements emerging in the climate of economic crisis and a formal politics deadlocked by an oligarchy riven by internal divisions have focused mainly on issues of economic unfairness and the erosion of formal democracy. War and peace issues so far constitute only a relatively minor strand in these stirrings, and disarmament per se is seldom mentioned.

At the same time, the rhetoric of indebtedness and the agenda of austerity being pushed by significant elements of the ruling corporate oligarchy have engendered a public discourse about spending, including military spending, that has grown increasingly incoherent. Some of the factions pushing hardest for steep cuts in government spending also are working to exempt the military from their effects. An explicit programme of austerity and economic stagnation for all but an increasingly insular top-tier economy of powerful large organizations and their more privileged inhabitants, however, is difficult to package and sell to an increasingly restive population. In this atmosphere, predicting outcomes becomes more difficult, particularly in areas like nuclear weapons spending where much of the real negotiating and decision-making goes on outside the public eye. Some nuclear weapons programmes may be viewed by those with meaningful influence over the relevant decisions as redundant, and hence easier to sacrifice than other military priorities viewed as having more immediate relevance to maintaining a status quo favourable to incumbent elites both abroad and at home. There is little sign, however, that reductions in nuclear weapons spending or changes in policy direction are likely to have a significant effect on the character of the US nuclear arsenal in the near term.

Ultimately, some of the same collisions of forces that might make cuts in US nuclear weapons spending more possible also are manifestations of a society and polity growing both less stable and more authoritarian. These remind us that the character of governments in extreme circumstances can change a great deal, and that nuclear weapons are unsafe in any hands.

STATUS OF US NUCLEAR FORCES

In 2010, the United States released information about the size of its nuclear arsenal, stating that as of the end of 2009 it had an active stockpile of 5113 nuclear weapons.[1] This number includes both "active" and "inactive" warheads, with the "active" category including "strategic and nonstrategic weapons maintained in an operational, ready-for-use configuration, warheads that must be ready for possible deployment within a short timeframe, and logistics spares."[2] In addition, the US has "several thousand" nuclear weapons listed as "retired".[3] Independent experts estimate that the US has approximately 3500 such "retired" warheads.[4] An unknown percentage of these "retired" warheads have not been released by the Department of Defense for

dismantlement, but instead are being held in "managed retirement" status, which requires that they be maintained "in such a way that they could be reactivated should a catastrophic failure in the stockpile necessitate such action."[5] Dismantlement rates have ranged from about 250 to 650 annually in recent years.[6]

The United States currently reports 1790 "strategic" nuclear weapons as "deployed" on intercontinental ballistic missiles, submarine-launched ballistic missiles, and heavy bombers.[7] The definition of "deployed" used by the United States is that agreed to with Russia in the 2010 Strategic Arms Reduction Treaty (START). This does not count warheads that are in the stockpile that could be carried by delivery systems not defined as deployed. This is of particular importance, for example, in regard to nuclear-capable heavy bombers. Each deployed bomber is tallied as one countable only warhead, but could carry many more. Hans Kristensen and Robert Norris, generally considered to provide the most authoritative independent account US nuclear force levels in their annual "Nuclear Notebook" series in the *Bulletin of Atomic Scientists*, estimate that the 60 strategic bomber aircraft that they estimate the US currently assigns to nuclear missions could carry a total of 1136 nuclear bombs and cruise missiles.[8] Kristensen and Norris estimate that the US stockpile includes 760 non-strategic weapons with about 200 nuclear bombs actively deployed, most of them at air bases in NATO countries in Europe.[9]

Delivery systems

The United States deploys its nuclear weapons via a "triad" of delivery systems: land based intercontinental ballistic missiles (ICBMs), submarine-launched ballistic missiles (SLBMs), and both heavy bombers and other strike aircraft. The US currently deploys 448 Minuteman III ICBMs in underground silos in the central United States, carrying either a single 300 kiloton (kt) W87 warhead or one to three 335 kt W78 warheads. Trident D5 SLBMs are carried aboard 14 Trident submarines, each with 24 launch tubes. Twelve of these submarines currently are operational and two are undergoing maintenance and refitting. The December 2011 US START data release listed 249 Trident SLBMs as deployed, meaning the missiles were in launch tubes in submarines, an average of just over 20 missiles per boat. Each missile is estimated to carry four warheads, either the 100 kt W76 or the more modern 455 kt W88 (the latter accounting for about a third of deployed SLBM warheads).[10]

The US has two long-range heavy bombers assigned to nuclear missions—the B-2 stealth bomber and the venerable B-52H, the latest version of a design that has been in service since the 1950s. The 2010 Nuclear Posture Review stated that 76 B-52H bombers and 18 B-2 bombers can be equipped with nuclear weapons.[11] Kristensen and Norris estimate that 16 B-2s and 44 B52s are assigned to nuclear missions. Three types of nuclear gravity bombs are carried by the B-2: the 10 to 360 kt variable yield B61-7; the 400 kt B61-11 (a modification developed during the 1990's to add some earth-penetrating capability); and the 1.2 megaton B83 (also with variable yield). B-52s carry the B61-7, B83, and air-launched cruise missiles armed with 5 to 150 kt W80-1 warheads.[12]

Non-strategic B61-3, 4, and 10 bombs can be delivered by US F-15 and F-16 strike aircraft and by nuclear-certified NATO F-16s and P-200 Tornados. The non-strategic B61s have variable yields ranging from 0.3 to 170 kt. There are about 400 in the active stockpile, with approximately 180 estimated to be deployed at NATO bases in Europe.[13] Navy nuclear-armed Tomahawk cruise missiles carrying W80 5–150 kt warheads, previously retained in non-deployed status, are now slated for retirement.[14]

Fissile materials

The United States has produced approximately 850 tons of highly enriched uranium (HEU). Most was made for use in nuclear weapons; the rest has been used or stockpiled for naval nuclear reactor fuel. Some HEU from nuclear weapons that were decommissioned as the arsenal declined from massive Cold War levels also has been earmarked for use in naval reactor fuel. Approximately 260 tons of HEU is either in nuclear weapons or available for nuclear weapons use. Approximately 100 tons has been made into naval reactor fuel and 130 tons of HEU is designated for future use in naval reactors. 180 tons has been used in reactor fuel and nuclear tests or has been transferred to other countries. 174 tons of excess HEU has been designated for down-blending to low-enriched nuclear reactor fuel.[15]

The US in 1994 had approximately 100 tons of plutonium: 85 tons weapon-grade and fifteen tons non-weapon-grade. 38 tons either are in nuclear weapons or are designated for nuclear weapons use. All of the non-weapon-grade plutonium and 47 tons of weapon-grade plutonium has been declared to be excess.[16] Much of the weapons grade plutonium is either still in decommissioned nuclear weapons or is in plutonium pits stored at the National Nuclear Security Administration's Pantex facility in Texas. Much of the excess plutonium, including plutonium from nuclear weapons, is slated to be converted into mixed oxide commercial nuclear reactor fuel, under a US-Russia agreement for plutonium disposition.[17] Conversion of plutonium to plutonium oxide conducted at the Los Alamos National Laboratory in New Mexico and fuel fabrication at the Savannah River plant in South Carolina.

MODERNIZATION

The government of the United States officially is committed to modernizing its nuclear bombs and war-

heads; the submarines, missiles, and aircraft that carry them; and the laboratories and plants that design, maintain, and manufacture nuclear weapons. US policy and budget documents all manifest an intent to keep some thousands of nuclear weapons in active service for the foreseeable future, together with the capability to bring stored weapons back into service and to design and manufacture new weapons should they be desired.

Continuing modernization of the US nuclear arsenal since the end of the Cold War has been driven by several different dynamics. There is the presumption, which prevails until definitively negated and until US nuclear targeting plans requiring large numbers of weapons change, that the United States will keep a large nuclear arsenal for many decades to come.[18] Second is the still-considerable economic and political power of the immense nuclear weapons complex and associated elements of the aerospace-military-industrial complex, a national web of institutions that continues to deploy an array of ideological and institutional techniques to sustain their flow of tax dollars. Finally, there have been repeated efforts by particular administrations and by factions within the military-industrial-congressional complex to develop nuclear weapons with additional capabilities, such has earth penetrators and weapons offering more accurate, low-yield options. Conflict in the mainstream over nuclear weapons policy has been limited for the most part to this last area, the development and deployment of weapons that can be characterized as "new weapons." There has been a strong consensus in the US political class—regardless of which party has held the Presidency or the Congressional majority—for maintaining a large arsenal deliverable via a "triad" of land-based missiles, submarine launched missiles, and aircraft, and for modernizing the facilities needed to do so, with some debate over what this actually requires. This consensus has shown little change since the end of the Cold War.

The course of nuclear weapons modernization efforts in the post-Cold War period reflects both institutional power and policy inertia tending to support continued arsenal modernization. It also reflects the tensions over development of new weapons systems that might be perceived as particularly provocative. Recognizably new weapons concepts, when publicly proposed, usually have been defeated, sometimes with Congressional language explicitly limiting particular research efforts. Since the first Iraq war, elements in the military had been seeking nuclear weapons with new capabilities, particularly low-yield and earth-penetrating weapons with increased capability to destroy underground structures with reduced collateral damage. Congress, however, prohibited research on very low-yield nuclear weapons in 1993 and proved resistant to development of nuclear weapons that were unambiguously "new" throughout the 1990s. Congress loosened these restrictions, however, during the frenzied military buildup following the 11 September 2001 attacks, with the Bush administration pushing the development of new weapons such as a "robust nuclear earth penetrator". Despite authorizing expanded research, Congress remained resistant to allowing distinctively "new" bombs and warheads to advance beyond feasibility studies and the early design stage.[19]

The Bush administration also pushed for advances in delivery systems that would increase nuclear weapons capabilities during this period. The Navy, for example, conducted an "enhanced effectiveness" (E2) programme to increase the accuracy of the Mark IV reentry vehicle deployed on many Trident SLBMs. The programme was labeled explicitly as having the potential for new nuclear weapons capabilities: "Enhanced Effectiveness provides increased capabilities articulated in the NPR, such as prompt accurate strike, defeat of critical targets and selective nuclear options."[20] Although never developed past the flight test phase, "[t]he E2 warhead could possibly have provided Trident missiles with the accuracy to strike within 10 meters of their intended, stationary targets."[21]

There has been one "modification" with what is generally conceded to be a new capability, the B61-11, which added limited earth-penetrating capability to the venerable and versatile B61 bomb design. A number of incremental upgrades in both warheads and delivery systems, however, have gone largely unchallenged. Modernization of the command and control, surveillance, targeting, and communications infrastructure associated with nuclear weapons deployment and use, along with research on nuclear weapons effects, has continued throughout the post-Cold War period (although at a slower pace), seldom being a subject of public discussion.

Bomb and warhead modernization

The National Nuclear Security Administration (NNSA) calls its projects for sustaining and modernizing the types of nuclear bombs and warheads currently in the active stockpile "life extension programs (LEPs)."These are for the B83 and B61 series bombs, the W76 and W88 SLBM warheads, the W78 and W87 land-based ICBM warheads, and the W80 cruise missile warhead.[22] One LEP, for the W87 Minuteman missile warhead, was completed in 2004.[23]

The US currently has an official policy of making no "new" nuclear weapons and of not adding "new" military capabilities to existing ones. The 2010 Nuclear Posture Review Report declared, "The United States will not develop new nuclear warheads. Life Extension Programs (LEPs) will use only nuclear components based on previously tested designs, and will not support new military missions or provide for new military capabilities."[24]

There has been considerable controversy during the post-Cold War period, however, about what constitutes a "new" weapon or a "new" capability. As noted above,

the US in the late 1990s produced a modified B61-11 bomb that added earth-penetrating capability.[25] Incremental upgrades made in the course of life-extensions and less extensive refurbishment actions also can provide bombs and warheads with new capabilities. Developments in arming, firing, and fusing systems, for example, can make nuclear weapons more effective for destroying hardened or underground targets by adding ground bursts capability and greater accuracy. Upgrades to the fusing system that controls the height of burst for the W76 will improve hard target destruction capability when combined with the highly accurate Trident D5 submarine launched ballistic missile.[26] The W76 LEP incorporates upgraded arming, fusing, and firing assemblies is slated to be completed by 2018.[27] Approximately 1200 W76 warheads are expected to be refurbished.[28] The B83 bomb also was modified in a previous refurbishment to "provide new MC required heights of burst."[29]

The NNSA is in the early stages of perhaps its most extensive refurbishment program so far, covering the B61 series of bombs. The 2010 Nuclear Posture Review calls for a "full scope B-61 (nuclear bomb) Life Extension Program to ensure its functionality with the F-35 and to include making surety—safety, security, and use control—enhancements to maintain confidence in the B-61." The F-35 will be a modern, stealthy strike aircraft, and equipping it with nuclear weapons will provide more advanced non-strategic nuclear delivery options. Further, NNSA is planning to replace all currently deployed bombs in the B61 series (with the exception of the high yield, earth-penetrating B61-11) with a single new design with a maximum yield of 50KT. The new design also will add a guided tail kit adapted from one already used in modern conventional bombs. Plans call for the new bomb, designated the B61-12, to be deliverable via both air and ground burst, and to be compatible with both current US and NATO nuclear-qualified aircraft and the F-35.[30] Despite US claims that its modernization programmes will add no new military capabilities, the new B61 bomb, if built, will allow the targeting of a wide range of targets with more accurate, lower yield nuclear weapons. As Hans Kristensen of the Federation of American Scientists observes,

> Increasing the accuracy of the B61 has important implications for NATO's nuclear posture and for nuclear targeting in general. In Europe, the new guided tail kit would increase the targeting capability of the nuclear weapons assigned to NATO by giving them a target kill capability similar to that of the high-yield B61-7, a weapon that is not currently deployed in Europe. This would broaden the range of targets that can be held at risk, including some capability against underground facilities. In addition, delivery from new stealthy F-35 aircraft will provide additional military advantages such as improved penetration and survivability.[31]

Kristensen also notes that the B61 replacement will achieve many of the goals of the low-yield nuclear weapons initiatives that Congress had limited or refused to fund during the Clinton and Bush administrations:

> Mixing precision with lower-yield options that reduce collateral damage in nuclear strikes were precisely the scenarios that triggered opposition to PLYWD and mini-nukes proposal in the 1990s. Warplanners and adversaries could see such nuclear weapons as more useable allowing some targets that previously would not have been attacked because of too much collateral damage to be attacked anyway. This could lead to a broadening of the nuclear bomber mission, open new facilities to nuclear targeting, reinvigorate a planning culture that sees nuclear weapons as useable, and potentially lower the nuclear threshold in a conflict.[32]

Another major LEP effort for the W78 ICBM warhead is in the early planning stages. This LEP will look at options that will produce either a warhead or some warhead components that could be used on both ICBMs and SLBMs. The LEP for the W88 SLBM warhead, the most modern nuclear weapon in the active stockpile, is expected to begin in the latter half of this decade. Work on a replacement arming, firing, and fusing system will start earlier, in order to determine whether a common option can be developed for the W78 and the W88.[33] The W80 cruise missile warhead is slated to get its LEP in the 2020s, although the schedule and nature of the W80 refurbishment may be affected by the outcome of a Defense Department study on new stand-off missile options.[34]

Delivery system modernization

The United States is both continuing incremental upgrades in its existing missiles and aircraft and starting planning and design of the next generation of nuclear-armed missiles, aircraft, and missile submarines.

The US aircraft that are equipped to deliver nuclear weapons also are used for conventional missions, in a context of combat operations that have been ongoing for two decades, since the first Iraq war. These aircraft undergo continuing rounds of refurbishment and modernization. B-52 bombers are undergoing a "comprehensive program" begun in the 2005 fiscal year "to ensure B-52 viability to perform current and future wartime missions to include datalinks, navigation, sensors, weapons, and electronic warfare (EW) and training capabilities."[35] The B-2 stealth bomber is being extensively modernized to allow it "to continue operations around the world in more advanced threat environments,"[36] with upgrades to its radar, data and communications, and defensive systems.[37] The dual-capable F-16 and F-15 strike aircraft that can carry nonstrategic B61 bombs also are undergoing constant rounds of modernization to incorporate available upgrades in avionics, communications, and other technologies.[38]

The Minuteman III land based ICBM is undergoing an extensive overhaul to extend its operational life through 2030. In March 2011 the Commander of the US Strategic Command said that "the Air Force is currently in a multi-year program to refurbish or modernize practically every inch of the Minuteman III—from the top of the nose cone to the bottom of the first stage nozzles."[39] Modernization efforts include upgrades to silos, missile command centers, guidance and reentry vehicle technologies, and targeting systems. The modernization effort also will complete the retirement of the W62 warhead (170 KT yield) from the Minuteman force and its replacement on some of Minuteman missiles by the more modern 300KT W87, originally deployed on the now-decommissioned Peacekeeper missiles.[40]

The Trident D5 SLBM also is being refurbished, with an LEP that will modernize guidance systems and missile electronics and that will also build additional D5 missiles.[41] Like the Minuteman modernization effort, virtually every component of the Trident missiles will be updated.[42] The Ohio class submarines that carry the Trident missiles also are undergoing cycles of refurbishment and modernization to maintain them for several more decades, with the current plan being to phase them out and replace them with a new ballistic missile submarine beginning at the end of the 2020s.[43] Work now underway includes upgrades in sonar communications, and other shipboard electronics.[44] In addition, over the last decade the Navy completed the conversion of four of the earlier Ohio class submarines built to carry the C4 Trident I missile to carry the larger Trident II D5.[45] All 14 US ballistic missile submarines now carry the D5, an upgrade over the C4 in range, payload, and accuracy.

The United States currently is in various stages of development of the next generation of nuclear-armed planes, missiles, and submarines, with the planning and deployment horizon for the new systems extending well into the middle of the century. The Obama administration announced long-term commitments to delivery system modernization, including the development of follow-on systems to replace those of Cold War vintage, in the 2010 Nuclear Posture Review and in reports to Congress released in the context of the Senate ratification process of New START. Although these commitments were made less than two years ago, the US is in the throes of an ongoing budget impasse resulting in one extraordinary temporary procedural device after another postponing decisions on the most controversial spending matters. This in turn is a manifestation of the broader climate of economic uncertainty, of austerity programmes being imposed by financial elites on populations in both Europe and North America, and of stark divisions within the US political classes. At this writing, all of this casts some doubt regarding the extent to which the spending levels committed to by the Obama administration will be sustained in the coming budget year and after. The Obama administration's budget request for the 2013 fiscal year, submitted in February 2012, proposes to accomplish some reductions from planned spending by delaying or stretching out programmes.[46]

The Nuclear Posture Review stated that the Navy had been directed to begin development of a replacement for the Ohio class ballistic missile submarines, with the first of the existing ballistic missile submarines expected to be retired at the end of the 2020s. According to the NPR, the number of ballistic missile submarines may be reduced from 14 to 12 later in this decade, pending further review.[47] As currently envisioned, the Ohio class boats will be replaced by 12 new submarines with 16 launch tubes each. The first of the new submarines were originally slated to go into service in 2029, with 12 new boats deployed and the Ohio class submarines retired by 2040. The FY2013 budget request proposes delaying delivery of the new boats by two years.[48] The launch tubes will be designed to fit the life extended Trident D5 missile, so that both types of submarines can use the same missile during the transition.[49] Work also is ramping up on development of new naval reactors to power the next generation submarines, with the NNSA's Naval Reactor program requesting increased funding.[50] The US and the United Kingdom are cooperating on the development of their next-generation ballistic missile submarines, in particular in development of a modular Common Missile Compartment for missiles with the characteristics of the Trident D5, capable of being used by both the next generation of UK boats (expected to carry eight missiles each) as well as in the US Navy 16 missile design.[51] At this writing, however, plans for the Ohio SSBN replacement appear to be in flux, with some consideration being given to reducing the number of submarines acquired, perhaps by increasing the number of launch tubes on each boat.[52]

The Air Force conducted an Analysis of Alternatives for the Land Based Strategic Deterrent in the early 2000s, deciding at that time to modernize the Minuteman to extend its service life to 2030. A new analysis of alternatives for a possible Minuteman III replacement is slated to start in 2012.[53] The military also is looking for ways to reduce costs of both modernization of existing systems and of acquiring new ones by developing components that can be used on both land and submarine-based missiles.[54]

The F-35 Joint Strike Fighter already is in production, with nuclear-armed versions eventually expected to replace nuclear capable F-15s and F-16s. The F-35 programme, however, has been plagued by delays and cost overruns, so modernization of F-15s and F-16s will be extended to bridge the gap until the new aircraft is deployed.[55] If both the nuclear capable F-35 and the B61-12 bomb go forward as planned, the US will deploy more accurate low-yield non-strategic nuclear weapons, delivered by a new generation of stealth strike aircraft. The military also is in the early stages of selecting options

for new nuclear-armed long-range bombers and for the stand-off nuclear weapons they would carry. According to a report prepared in late 2010 in support of the Obama administration's New START ratification effort, "The long-range strike study, which is also considering related investments in electronic attack, intelligence, surveillance and reconnaissance, air- and sea-delivered cruise missiles, and prompt global strike, will be completed in time to inform the President's budget submission for FY 2012."[56] This study will be examining conventional as well as nuclear long-range strike options.

The 2010 Nuclear Posture Review stated that a study was in progress to examine alternatives for a new long-range bomber and a possible replacement for the air launched cruise missile.[57] The commitment to build a new long-range stealth bomber was reiterated in a January 2012 top-level Defense Department policy guidance document, *Sustaining U.S. Global Leadership: Priorities for 21st Century Defense*.[58] The Air Force in its FY2012 funding request budgeted almost $900 million over the next five years for research and development to replace the air-launched cruise missile.[59]

The US also has been engaged for more than a decade in efforts aimed at taking advantage of improvements in the accuracy of long range missiles and re-entry vehicles to develop the means to deliver non-nuclear weapons anywhere on earth in short order. These programmes, referred to as Prompt Global Strike, have explored adding non-nuclear payloads to Minuteman ICBMs and Trident SLBMs, as well as placing payloads on other rocket boosters in a variety of basing scenarios. The Obama administration reportedly is considering an additional option that would place conventionally armed intermediate range ballistic missiles on attack submarines.[60] Using ICBMs and SLBMs poses dangers of conventional "Prompt Global Strike" launches being mistaken by other nuclear-armed states for a nuclear attack, so Congress has been reluctant to proceed with deployment on existing systems, particularly on ballistic missile submarines, as opposed to land-based systems that at least in theory could be located so as to reduce the dangers of a conventional launch being mistaken for a nuclear one. Congress has attempted to consolidate these programmes into a single research effort and has reduced total funding. Nonetheless, several different reentry vehicle technologies, including SLBM reentry vehicle systems with accuracy upgrades and boost-glide vehicles stemming from a long-running Air Force "Common Aero Vehicle" project intended to allow both great range and maneuverability, have proceeded to the flight-testing phase.[61]

The Obama administration appears committed to continuing the Prompt Global Strike effort, seeing it as a way to add previously unavailable options for strategic strike—some of which may fall outside the existing arms control framework. Principal Deputy Under Secretary of Defense for Policy, Dr. James N. Miller, told a House committee in March 2011, after New START had been concluded, that

> The 2010 NPR noted the potential value of CPGS [Conventional Prompt Global Strike] capabilities to defeat time-urgent regional threats. DoD is exploring in particular the potential of conventionally-armed, long range missile systems that fly a non-ballistic trajectory such as boost-glide systems. Such systems could "steer around" other countries to avoid over-flight and have flight trajectories distinguishable from an ICBM or submarine launched ballistic missile (SLBM). As we made clear during the New START Treaty negotiations, we would not consider such non-nuclear systems, which do not otherwise meet the definitions of the New START Treaty, to be "new kinds of strategic offense arms" for the purposes of the Treaty.[62]

Prompt Global Strike (PGS) systems, if developed and deployed, add a volatile new element to the nuclear balance, raising the possibility that a range of targets previously only vulnerable to nuclear-armed long range missiles could be destroyed with non-nuclear weapons. Further, missile and reentry system technologies developed nominally for conventional weapons delivery could be applied to nuclear weapons, either via incremental upgrades to nuclear systems or, should the US choose to change its policy regarding their use, via deployment of nuclear weapons on new long-range systems once developed. Current iterations of the Air Force Common Aero Vehicle boost-glide concept, for example, dubbed the Hypersonic Technology Vehicle, continue to be developed and tested.[63] In its early phases the Common Aero Vehicle was conceived as a system that could deliver either conventional or nuclear weapons, although after the late 1990s the programme was limited to exploration of potential non-nuclear payloads.[64] The "Prompt Global Strike" programmes essentially are the extension of efforts stretching back into the Cold War to push reentry vehicle capabilities to the limits of available technology.[65] Although funding for conventional strike PGS has declined since its peak in the Bush years, it remains a source of technologies that could yield new strategic weapons capabilities both conventional and nuclear.

THE US HAS BEEN ENGAGED FOR MORE THAN A DECADE IN EFFORTS AIMED AT TAKING ADVANTAGE OF IMPROVEMENTS IN THE ACCURACY OF LONG RANGE MISSILES AND RE-ENTRY VEHICLES TO DEVELOP THE MEANS TO DELIVER NON-NUCLEAR WEAPONS ANYWHERE ON EARTH IN SHORT ORDER.

Finally, US Strategic Command is continuing a long-running project to integrate nuclear and conventional strike planning, together with missile defences and the full range of surveillance, warning, and command and control systems.[66] The US also is modernizing the command and control systems that link the President to nuclear forces and command networks.[67]

RESEARCH, TESTING, AND PRODUCTION

In addition to modernizing warheads and delivery systems, the US is refurbishing and upgrading many of the facilities where nuclear weapons are designed, tested, and manufactured. These activities are most visible at the government owned-contractor operated complex of laboratories and plants that conduct nuclear weapons research and development and that produce nuclear bombs and warheads. The planes, missiles, and submarines that carry nuclear weapons are manufactured by large private aerospace contractors, often with components scattered across networks of sub-contractors, so facility modernization is funded less directly by the federal government. In some areas, however, the government is taking more active steps to assure that industrial capacity for nuclear weapons systems will be sustained, particularly where the pace of acquisitions has slowed considerably compared to the rapid, large scale cycles of strategic weapons production characteristic of the Cold War era.

The work of designing, building, and maintaining US nuclear bombs and warheads is done at eight sites in seven states. The laboratories at Los Alamos, New Mexico and Livermore, California do weapons research and design and a variety of tasks to keep existing nuclear weapons ready to go. The Los Alamos National Laboratory also makes the plutonium "pits" that are the atomic trigger for thermonuclear weapons. The Sandia laboratories, in Albuquerque, New Mexico and Livermore, California, do engineering work on nuclear weapons and design and manufacture nonnuclear components. All three laboratories also conduct non-nuclear military research. The Nevada Test Site, where over a thousand nuclear weapons were exploded in the atmosphere and underground before the 1992 testing moratorium, continues to be used for underground experiments called "subcritical" tests that do not have a significant nuclear yield. The Test Site, now called the Nevada National Security Site, also houses facilities for other kinds of nuclear weapons experiments, including those requiring large open air non-nuclear explosions. These tests further develop nuclear weapons knowledge and help to keep the Test Site ready to resume full-scale nuclear testing if desired.

The remaining parts for nuclear weapons are manufactured at plants across the country. The Y-12 plant in Tennessee makes uranium parts and other components, including the secondaries that provide the fuel for the thermonuclear blast triggered by the explosion of the plutonium primary in most modern nuclear weapons. The Kansas City plant in Missouri makes and tests non-nuclear components. South Carolina's Savannah River facility extracts tritium, a radioactive isotope of hydrogen used to increase nuclear weapons yield, and fills the tritium containers for nuclear weapons. The Pantex plant in Amarillo, Texas assembles, modifies, and dismantles nuclear weapons, and also makes high explosive components. [68]

Over the last decade and a half, the Department of Energy has built billions of dollars worth of new experimental facilities across the nuclear weapons complex, expanding its capacity to conduct nuclear weapons research without full scale nuclear explosive testing. The National Ignition Facility (NIF) at the Lawrence Livermore National Laboratory in California was completed in 2009. The NIF is a laser driven fusion machine the size of a football stadium, designed to create very brief, contained thermonuclear explosions. The NIF and smaller high-power laser arrays at other DOE facilities are used for a wide range of applications, from training weapons designers in nuclear weapons science to nuclear weapons effects testing. The Dual Axis Radiographic Hydrotest Facility (DARHT) began operating in 2008. This facility at the Los Alamos National Laboratory in New Mexico joined already existing facilities where mockups of primaries or "pits," the first stage of a thermonuclear weapon, are imploded while very fast photographic or x-ray images are generated, thus allowing scientists to "see" inside the implosion. Further experiments exploring the extreme conditions created in a nuclear weapon explosion are studied using various types of "pulsed power," in which a large amount of energy is stored up and then released very quickly in a small space. The energy source can be chemical high explosives or stored electrical energy. Pulsed power facilities at both DOE and Department of Defense laboratories are used to explore nuclear weapons function and effects and directed energy weapons concepts.

The data streams from these and other experimental facilities, along with that from "subcritical" tests, which implode nuclear materials but have no measurable nuclear yield and the archived data from over 1000 past US nuclear tests, will be integrated via the Advanced Simulation and Computing Program. This multi-billion dollar supercomputing programme reaches beyond the weapons laboratories, seeking to incorporate the nation's leading universities into an effort to attract and train yet another generation of nuclear weapons designers.

The NNSA also has an array of facilities to test other aspects of nuclear weapons functions, such as the forces and stresses nuclear weapons would be subjected to during delivery to their targets, ranging from the effects of radiation and lightning to rapid acceleration and deceleration. NNSA plans to modernize many of these fa-

cilities in the near future and to consolidate them at the Sandia laboratory in Albuquerque, New Mexico, where many already are located. NNSA expects an increased work load for these facilities from the life extension program for the B61 bomb series, a significant redesign and modification project.[69]

This vast array of nuclear weapons testing and simulation facilities has allowed the continuing modernization of US nuclear weapons, sometimes adding new capabilities to existing systems. General James Cartwright, then Commander of U.S. Strategic Command, described the possibilities:

> [I]f my modeling and simulation really understands the environment in which that weapon will go to, I can do things with it that allow me to stay within the law which says that I have to leave the current warhead configuration as it is, but that I can take my 1966 Mustang, which is when most of these assets were made available to me, and I could put seatbelts, airbags, antilock brakes, GPS in it. I could do a whole bunch of things that would fundamentally change the characteristic of that stockpile.[70]

A key element in US plans for its nuclear arsenal is the capacity to design and manufacture significant numbers of nuclear weapons. US nuclear weapons policy documents portray the ability to reverse reductions in the nuclear arsenal as a precondition for any such reduction. According to the 2010 Obama administration Nuclear Posture Review,

> [I]mplementation of the Stockpile Stewardship Program and the nuclear infrastructure investments recommended in the NPR will allow the United States to shift away from retaining large numbers of non-deployed warheads as a hedge against technical or geopolitical surprise, allowing major reductions in the nuclear stockpile. These investments are essential to facilitating reductions while sustaining deterrence under New START and beyond.[71]

In addition to expanding its suite of testing and simulation facilities, for which the first round of major post-Cold War projects is largely complete, the NNSA is modernizing its facilities for the manufacture of nuclear bombs and warheads and their components. Nuclear weapons research and production is being consolidated at eight major NNSA weapons complex sites, down from fifteen at the end of the Cold War.[72] Plants built to produce immense Cold War nuclear stockpiles are being replaced by a combination of new facilities and new manufacturing lines and equipment relocated to refurbished nuclear facilities. The modernized complex is expected to be capable of sustaining an arsenal of 3000–3500 weapons, including reserves and spares.[73] As key new facilities such as those for uranium and plutonium component manufacture will become operational only in the 2020s, US plans envision sustaining thousands of nuclear weapons into the middle of this century.[74]

THE MODERNIZED COMPLEX IS EXPECTED TO BE CAPABLE OF SUSTAINING AN ARSENAL OF 3000–3500 WEAPONS, INCLUDING RESERVES AND SPARES.

NNSA asserts that the entire complex of modernized research, production, and testing facilities will be needed for the foreseeable future, and that further reductions in arsenal size would not result in cost savings or significant scaling back of activities in the weapons complex:

> After achieving a capability-based infrastructure, smaller total stockpiles than prescribed by post-NPR implementation strategies would not lead to a smaller, less costly infrastructure.... Once the number of warheads falls below a specific level, the costs just to maintain the required capabilities dominate. This is because most facilities, operations, and critical skills must exist, be maintained, and be exercised to remain viable.[75]

NNSA has long asserted that the highest priority large projects in production complex modernization are for plutonium operations at Los Alamos and for uranium operations at the Y-12 plant in Tennessee. The PF-4 facility at Los Alamos (part of the laboratory's main plutonium facility) is being refurbished and configured for production of up to 80 plutonium pits per year by 2022. Los Alamos has been preparing an adjacent site for construction of a large new nuclear facility, the Chemistry and Metallurgy Research Replacement Nuclear Facility (CMRR-NF). The CMRR-NF, if built, would provide new facilities for plutonium research and analytical operations in support of pit production and maintenance. At Y-12, NNSA plans to replace facilities for production and dismantlement of enriched uranium components with a new consolidated Uranium Processing Facility (UPF), also with a goal of achieving operational status by 2022. Consolidation and replacement of additional manufacturing functions necessary for the production of nuclear weapons secondaries at Y-12 is planned for the late 2020s.[76] NNSA also is replacing its main facility in Kansas City, Missouri for the manufacture of non-nuclear components with a new plant, the newly constructed building to be constructed and leased via a public-private partnership involving the federal government, a Kansas City local public development authority, and a private company.[77]

Both the CMRR-NF and the UPF will cost billions of dollars and take a decade or more to complete. The UPF is estimated to cost between $4.2 billion and $6.5 billion.[78] For CMRR, originally estimated to cost $375 million, the latest cost projection is $3.7 billion to $5.9 billion.[79] The project's cost has increased both because the NNSA has expanded its scale and scope and because of difficulties posed by seismic risks at the project site. The CMRR-NF has been slowed by redesigns

necessitated in part by seismic issues, and also by local opposition including litigation challenging its environmental review process.[80] In December Congress cut $100 million from a $270 million appropriation for the CMRR and prohibited construction work in the coming fiscal year.[81] The February 2012 Budget Request for fiscal year 2013 proposes deferring construction of the CMRR for at least five years while examining other alternatives.[82] The decision to cut current CMRR funding already has sparked opposition in Congress, with Michael Turner, Chair of the Strategic Forces Subcommittee of the House Armed Services Committee, introducing legislation requiring construction of the CMRR and fulfillment of other funding commitments made by the Obama administration in connection with ratification of New START.[83] Nonetheless the CMRR-NF, a problematic project with large and rapidly escalating costs that likely is not essential to sustaining the current nuclear arsenal, is among the major US nuclear weapons projects most likely to be eliminated.

US nuclear weapons delivery systems also continue to be flight tested, entailing a separate array of test ranges and ground facilities. Both ICBMs and SLBMs are flight tested several times per year.[84] Field and flight testing facilities being refurbished or modernized include the Western missile range with launch facilities at Vandenberg Air Force Base in California (ICBM and SLBM flight tests, Prompt Global Strike flight tests), the Eastern range with launch facilities at Cape Canaveral, Florida (SLBM flight tests), the Kwajalein test site (downrange from Vandenberg), and the Tonopah Test Site in Nevada (bomb flight and drop tests).[85]

The military is undertaking additional efforts to assure that technical and industrial capacities that are either maintained by military contractors or that are scattered across the military and NNSA laboratory systems are sustained over the long term. This includes a campaign to sustain the industrial base for solid rocket motors,[86] needed for ICBMs and SLBMs (as well as for other rocket and missile applications), and an effort to sustain a wide range of nuclear weapons effects testing capabilities.[87] The primary function of the nuclear weapons effects facilities is to assure that US military hardware, from electronics used by conventional forces to missile defence systems and nuclear weapons, can operate in an environment where nuclear explosions are occurring. These facilities also can be used to study certain effects of nuclear weapons on adversary facilities and systems.

MODERNIZATION AND DISARMAMENT COMMITMENTS

The nuclear Non-Proliferation Treaty (NPT) entered into force in 1970. Article VI committed member nuclear weapons states, including the United States, to "negotiation in good faith on effective measures relating to cessation of the nuclear arms race at an early date." In 1996, the International Court of Justice ruled that article VI requires the signatory nuclear weapons states not only to negotiate, but to achieve disarmament.

More than two decades after the end of the Cold War and four decades after the US signed and ratified the NPT, the United States and Russia retain nuclear arsenals large enough to end civilization in short order. Six other states have enough nuclear weapons to inflict severe damage not only on their own regions but on the global environment. After fairly rapid rounds of reductions from the immense "overkill" arsenals of the Cold War era, the pace of reductions has slowed considerably. Discontent among non-nuclear weapons states with lack of disarmament progress nearly led to an impasse at the 1995 NPT Review and Extension Conference, with the Treaty only being extended indefinitely in exchange for further commitments on the part of the nuclear weapons states regarding concrete steps on disarmament. In their efforts to obtain the Treaty's indefinite extension, the nuclear weapons states that are parties to the NPT, including the United States, agreed to a non-binding package of "Principles and Objectives" for non-proliferation and disarmament. These included the conclusion no later than 1996 of negotiation of a Comprehensive Test Ban Treaty (CTBT) banning nuclear explosive testing and "the determined pursuit by the nuclear-weapon States of systematic and progressive efforts to reduce nuclear weapons globally, with the ultimate goals of eliminating those weapons, and by all States of general and complete disarmament under strict and effective international control."[88] Also adopted was a call for universal adherence to the treaty and progress towards establishment of a Middle East zone free of weapons of mass destruction (WMD).

Between 1995 and 2000, however, the United States and the other nuclear weapons states showed little progress on disarmament. The CTBT, centerpiece of the tacit bargain underlying the 1995 NPT extension, was rejected by the US Senate in 1999. The US continued to modernize its arsenal, pursuing what appeared at least to potential adversaries to be weapons with new capabilities, such as the B61-11 earth penetrating bomb. In 1998 India and Pakistan, neither parties to the NPT, engaged in a dramatic round of nuclear testing, demonstrating the fragility of the non-proliferation regime and the possibility of dangerous new regional arms races if the NPT collapsed. There had been no progress towards discussion of a WMD free zone in the Middle East, or of what to do about Israel's undeclared nuclear arsenal.

At the 2000 NPT Review Conference, the non-nuclear weapons states pushed through a more comprehensive list of "practical steps" towards fulfillment of the NPT article VI disarmament obligation. The key commitments over which the US government could exercise the most control included ratification of the CTBT; the principle of irreversibility as applied to nuclear

disarmament and related arms control and reduction measures; an "unequivocal undertaking" to accomplish the total elimination of their nuclear arsenals; full implementation of the START II and START III treaties then under consideration by the US and Russia; "preserving and strengthening the Treaty on the Limitation of Anti-Ballistic Missile Systems as a cornerstone of strategic stability and as a basis for further reductions of strategic offensive weapons"; concrete measures to reduce the operational status of nuclear weapons (i.e. de-alerting); and a diminishing role for nuclear weapons in security policies.[89] The US government views these as political, rather than legal, commitments. There are good arguments, however, that while such commitments may not constitute new binding obligations, they do provide legal criteria for assessing compliance with existing ones.[90]

Over a decade later, the United States has shown some paper progress, but behind the words and even the treaties there is little evidence of substantive, "good faith" commitment to nuclear disarmament. The United States still has not ratified the CTBT. Both the Bush and Obama administrations have completed nuclear arms control treaties with the Russians and had them duly approved by the Senate. Neither the Bush-era 2002 Strategic Offensive Reductions Treaty nor New START fundamentally change the character of nuclear weapons deployments. Both allow a "triad" long-range missiles launched from land or submarines as well as bombs and cruise missiles on long-range bombers. Neither placed new limits on shorter range "non-strategic" nuclear-armed air or missile systems.[91] Each country still is allowed to deploy thousands of nuclear weapons, with no limits on the number of weapons that can be held in reserve, or on the productive capacity to build yet more.

Meanwhile, the US announced its withdrawal from the Anti-Ballistic Missile Treaty Treaty in December 2001, effective six months later.[92] Continuing US development and deployment of ballistic missile defence systems remains an impediment to disarmament progress, with Russia threatening to place short-range missiles on its Western borders and to withdraw from New START if the US goes ahead with plans for deployment of anti-ballistic missile systems in Eastern Europe.[93]

There is a more disturbing long-term trend as well, relevant to the commitments in the 2000 NPT Review Conference Final Document for an "unequivocal undertaking" to eliminate nuclear arsenals and the "principle of irreversibility to apply to nuclear disarmament, nuclear and other related arms control and reduction measures."[94] To a certain degree there is a reciprocal relationship between these two commitments, particularly where modernization of nuclear weapons infrastructure is concerned. Endless modernization of the research laboratories and factories necessary to design and produce nuclear weapons is inherently incompatible with any "principle of irreversibility" in regard to disarmament. Doing so with the express intention of being able to re-arm, to permanently hold open the potential to reconstitute large nuclear arsenals throughout the course of disarmament, also is inconsistent with an "unequivocal undertaking" to eliminate nuclear arsenals.

Current US nuclear weapons policies state that the US "must maintain a basic set of production, scientific, and engineering capabilities" that will be "responsive to changing world demands" and be capable of sustaining the existing stockpile while producing up to 80 nuclear weapons per year.[95] "NNSA's 'capability-based' plan for modernization provides sustainment of essential capabilities by retaining in a state of readiness the minimum facilities, equipment and critically skilled individuals needed to design, develop, manufacture, maintain, surveil and assess the nuclear weapons stockpile."[96] The 2010 Nuclear Posture Review portrayed the capability to produce new weapons to be put in place by the current round of modernization efforts as a "modest capacity" to "surge production in the event of significant geopolitical 'surprise.'"[97] Current plans for modernizing infrastructure call for the capacity to maintain support for "total stockpiles up to a range of approximately 3,000 to 3,500 active, logistic spare, and reserve warheads."[98] Further, according to US nuclear weapons complex planners, even reductions in arsenal size "would not lead to a smaller, less costly infrastructure." In their view, "[t]his is because most facilities, operations, and critical skills must exist, be maintained, and be exercised to remain viable."[99] The current plan seems to be to keep for the foreseeable future a full suite of nuclear weapons facilities with capabilities expressly designed to make arms reductions reversible, tending to make any commitment to disarmament appear more equivocal than not.

Another disturbing trend in the post-Cold War period has been the use by the nuclear weapons establishment, associated elements of the broader military-industrial complex, and their advocates in Congress of debate over arms control treaties as an opportunity to extract new commitments for facilities and funding. The late 1990s debate over ratification of the Comprehensive Test Ban Treaty resulted in solidified funding prospects for the first round of nuclear weapons facilities upgrades, purportedly to provide the "Stockpile Stewardship" program with the capabilities needed to maintain the arsenal without underground tests. More than a decade later, the United States has billions of dollars worth of new facilities like the Dual Axis Radiographic Hydrotest Facility at Los Alamos and the National Ignition Facility at Livermore, and makes much large annual nuclear weapons expenditures—but still has not ratified the Comprehensive Test Ban Treaty.[100] In 2010, the Obama administration engaged in something that came to resemble a bidding process in its

efforts to obtain Senate consent to ratification of New START, adding billions of dollars in promised spending for the nuclear weapons research and production complex and for nuclear weapons delivery systems over the course of the year, as well as political commitments to assure that the Treaty would not disturb the onward march of missile defense and "prompt global strike" development.[101]

Bob Corker, Republican Senator from Tennessee (home of Oak Ridge National Laboratory and the Y-12 plant) stated the trade-off clearly: "I saw this entire process as an opportunity to push for long overdue investments in modernization of our existing nuclear arsenal and made clear I could not support the treaty's ratification without it."[102] Following ratification he pronounced himself well satisfied with the result, declaring that "the New START treaty could easily be called the 'Nuclear Modernization and Missile Defense Act of 2010.'"[103]

IN THE UNITED STATES, NUCLEAR WEAPONS MODERNIZATION OVER THE LAST TWO DECADES HAS BEEN INTEGRALLY LINKED TO MOVEMENT TOWARDS A NUCLEAR NON-PROLIFERATION POLICY INCREASINGLY BASED ON THE THREAT OF OVERWHELMING MILITARY FORCE...

Regarding the diminishing of the role of nuclear weapons in security policies, the US declaratory nuclear weapons use policy has been moderated somewhat, with the Obama administration stating in the 2010 Nuclear Posture Review that "the United States will not use or threaten to use nuclear weapons against non-nuclear weapons states that are party to the Nuclear Non-Proliferation Treaty (NPT) and in compliance with their nuclear non-proliferation obligations."[104] The NPR also declared, however, that the US will not rule out use of nuclear weapons "in deterring a conventional or CBW [chemical or biological weapons] attack against the United States or its allies and partners" by "states that possess nuclear weapons and states not in compliance with their nuclear non-proliferation obligations."[105] So far the change in declaratory policy has had little discernable effect on US nuclear weapons policies or deployments. As shown above, modernization plans for US nuclear weapons that appear to add capabilities intended to make nuclear weapons more feasible in small scale conflicts and against non-nuclear-armed states continue to move forward (perhaps the most important current programme in this regard is the effort to replace existing B-61 bombs with a more accurate model with relatively lower yields, designed to be delivered by a new generation of stealth attack aircraft). It remains to be seen whether a follow-on review of US nuclear weapons policies and war plans now in progress, intended to implement the broad policy prescriptions of the Nuclear Posture Review and to examine the possibility of further reductions, will result in more concrete changes in programmes and policies.[106]

The Bush administration's decision to respond to the 11 September 2001 attacks on New York and Washington—committed by small armed bands employing a spectacular form of irregular warfare—with a massive arms buildup and a world-wide campaign of conventional wars and covert action launched the United States on an upward curve of intensifying militarism. The centerpiece of the Bush "Long War" was the invasion and occupation of Iraq, for which the politically decisive justification was the prevention of nuclear proliferation, with Bush administration officials from the President on down intoning the fearful trope that we could not wait for a "smoking gun" that could prove to be a "mushroom cloud."[107]

In the United States, nuclear weapons modernization over the last two decades has been integrally linked to movement towards a nuclear non-proliferation policy increasingly based on the threat of overwhelming military force. From the 1991 Gulf War on, a significant driver of nuclear weapons research has been the desire to develop accurate, low yield nuclear weapons and earth penetrating nuclear weapons that could destroy hardened targets with a single strike, making use of nuclear weapons more politically feasible as a "counterproliferation" tool. As an anonymous Pentagon staffer told the Washington Post in 2000, the goal at the time was to develop "'a deep penetrator that could hold at risk a rogue state's deeply buried weapons or Saddam Hussein's bunker without torching Baghdad.'"[108] This was during the Clinton years; the Bush administration both continued efforts to develop low yield and earth penetrating nuclear weapons and promulgated a policy of integrating nuclear and conventional forces and war planning.

One result of this ongoing, publicly visible effort to develop more useable nuclear weapons has been that "counterproliferation" crises are now frequently accompanied by rumours that the United States is considering the use of nuclear weapons against the alleged proliferator, giving rise to a climate of nuclear threat against states that have no nuclear weapons.[109] And whether or not nuclear weapons are likely to be employed, an approach to nuclear weapons proliferation that leans heavily on military threats, particularly on the part of a state that has just fought a war flimsily justified as necessary to prevent the spread of nuclear weapons, runs counter to the principles underlying the NPT and of the post-World War II international legal order. The NPT preamble also states that its goals are to be achieved "in accordance with the Charter of the United Nations," and that "States must refrain in their international relations from the threat or use of force against the territorial integrity or political independence of any State..."

Under the Obama administration, not much has changed yet beyond the rhetoric. US nuclear non-pro-

liferation strategy continues to lean far more heavily on military threats than diplomacy. The latest and most worrisome instance of this is the escalating campaign of force posturing and covert action against an Iranian government that has neither attacked the United States nor been proven to have an active nuclear weapons programme.[110] This, of course, assumes that the main purpose of US attempts to pressure and destabilize the Iranian government is to stop what it truly believes to be a nuclear weapons programme, an assumption that also rests more on the assertions of the US government than on independently verifiable evidence. What also should go without saying and yet time and time again cannot: no country has the right to declare threats to peace and to its interests that lie in the future, far outside any reasonable concept of present or imminent attack, by conducting a war of aggression. As the Nuremberg Judgment, a bedrock document of the Post World War II legal order, declared,

> War is essentially an evil thing. Its consequences are not confined to the belligerent states alone, but affect the whole world. To initiate a war of aggression, therefore, is not only an international crime; it is the supreme international crime differing only from other war crimes in that it contains within itself the accumulated evil of the whole.[111]

The country with the most powerful military one way or another will play a decisive role in the process of nuclear disarmament. A long-term policy of the world's most powerful state to prevent nuclear weapons proliferation by world-wide deployment of powerful military forces ultimately backed by nuclear weapons, a policy that in the view of much of the world has in practice been used as a stalking horse for hegemonic power politics, is far more likely to perpetuate arms racing than to end it. So long as the policy and practice of the world's dominant military power is to reduce its nuclear arsenal only to the extent that it can develop other weapons that allow it to project force in similar ways, prospects for reaching the goal of nuclear disarmament are unlikely to improve. The current administration on this point too has shown little sign of departing from the policies of its predecessors. Assuring a military audience that the President's policies constitute no decisive break from the past, Vice President Joe Biden stated that

> Capabilities like an adaptive missile defense shield, conventional warheads with worldwide reach, and others that we are developing enable us to reduce the role of nuclear weapons, as other nuclear powers join us in drawing down. With these modern capabilities, even with deep nuclear reductions, we will remain undeniably strong. As we've said many times, the spread of nuclear weapons is the greatest threat facing our country. That is why we are working both to stop their proliferation and eventually to eliminate them. Until that day comes, though, we will do everything necessary to maintain our arsenal."[112]

The adequacy and good faith of disarmament progress must be assessed in light of both the threat nuclear weapons pose in general and the place of the particular state in the global order of things. The United States sits at the apex of the global war and weapons system, not only the country with the most modern and sophisticated armed forces, of which nuclear forces remain an integral part, but home to the world's leading arms merchants and the country whose armed forces have been involved in more wars than any other over the last half century. Yet US political and military elites have shown a marked lack of urgency regarding nuclear disarmament, showing far more concern about the possible dangers posed by nuclear weapons that don't yet exist than about the thousands that still sit poised at the ready. The pace and scale of the arms reductions they have been willing to contemplate will do little to reduce the danger US nuclear weapons and weapons policies pose to the world over the next one to two decades. During this period, the current crisis of the global economic system and its attendant political dislocations, of a severity and duration unprecedented in the nuclear age, is likely to reach its peak. In the absence of a significant change in direction by the United States, nuclear disarmament likely will remain a dream so distant as to have little relevance for the near term prospects of humanity.

US NUCLEAR WEAPONS CONTRACTORS

US nuclear weapons, the associated systems for fighting nuclear wars, and the factories and laboratories to design, produce, and maintain it all are owned, managed, and operated by an interlocking network of public agencies and private corporations. These in turn are part of a military-industrial-political complex of unprecedented size and power, a social phenomenon still so new and large that it remains incompletely understood. Key actors within this vast array of institutions will play pivotal roles in the unfolding of the political crises emerging out of the deepening, intractable global economic crisis and its interaction with novel challenges of global scope, including the effects of societies encountering resource limits and the collapse of important elements of our ecosystems.

In the US today, wealth has become concentrated in the largest corporations and an ownership class largely comprised of the upper echelons of those same organizations, and there are virtually no legal limits on the use of money to influence elections and government decisions. In this milieu, the organizations that constitute the military-industrial complex are likely to play a decisive role in decisions about US military policy, including nuclear weapons matters, for the foreseeable future. And with the United States sitting at the apex

of the global system of military production and trade, deploying forces and selling weapons in conflict zones world-wide, these same powerful interests likely will play a part in the future of nuclear disarmament more significant than that of any government. Governments represent particular constellations of interests within states during the course of their rule. Few constellations of interests in the post-World War II era have approached the enduring power of the US military-industrial complex.

The Fiscal Year 2012 US military budget, including nuclear weapons spending, totaled about $650 billion, down slightly from the previous year.[113] If we add in other armed security programmes, internal and external, the intelligence agencies, and the costs of past military activities from veterans' health care to interest costs, the total annual US spending on "security" is over trillion dollars a year.[114] Even using the smaller figure, US military spending continues to dwarf that of all other states, constituting about 43% of the global total.[115] Since 2001 real US military spending has grown 81.5%, compared to 32.5% for the rest of the world.[116] In announcing a new Defense Strategic Guidance at the Pentagon in January 2012, President Obama emphasized that the current plan, at least, is for US military spending to continue to increase for the next decade:

> Over the next 10 years, the growth in the defense budget will slow, but the fact of the matter is this: It will still grow, because we have global responsibilities that demand our leadership. In fact, the defense budget will still be larger than it was toward the end of the Bush administration. And I firmly believe, and I think the American people understand, that we can keep our military strong and our nation secure with a defense budget that continues to be larger than roughly the next 10 countries combined.[117]

THE FISCAL YEAR 2012 US MILITARY BUDGET, INCLUDING NUCLEAR WEAPONS SPENDING, TOTALED ABOUT $650 BILLION

The United States also is the world's largest arms dealer. US arms accounted for over a third of 2010 arms transfers, and over half of the new arms transfer agreements in 2010, with Russia a distant second with less than half the total of US transactions in both categories.[118] Four of the five top arms manufacturers in the world—Lockheed, Boeing, Northrup-Grumann, and General Dynamics—are US companies,[119] and all are significant contractors for US nuclear weapons work as well. In shifting combinations of prime and sub-contractors, joint ventures, and partnerships, these firms and other US engineering, research, construction, and manufacturing companies both cooperate and compete in selling weapons systems and a broad array of services to the US nuclear weapons complex and the nuclear arms of the military. Some of the largest US public university systems also provide research and management services, adding as well a certain gloss of scientific neutrality and public interest commitment.

Most National Nuclear Security Administration facilities are government-owned enterprises managed by consortiums of private corporations or corporations and universities. The two main nuclear bomb and warhead design laboratories, the Lawrence Livermore Laboratory in California and the Los Alamos Laboratory in New Mexico, were managed by the University of California for most of their history, but were substantially privatized over the last decade. Los Alamos currently is managed by Los Alamos National Security, LLC, a joint enterprise of Bechtel National, the University of California, the Babcock and Wilcox Company, and the Washington Division of URS. Babcock and Wilcox is a diversified energy equipment and engineering company and a major player in the nuclear power industry. B&W also is a principal supplier of technology and engineering services for Navy shipboard nuclear reactors. URS is a multinational engineering, construction services, and military contractor, which extended its reach in the nuclear weapons arena with its 2002 acquisition of EG&G, a major US military contractor with a nuclear weapons history stretching back to the 1940s, including managing operations at the Nevada Test Site. Bechtel was present at the creation of the modern US military-industrial complex, and today has contracts in areas ranging from missile range management to chemical weapons disposition. Bechtel also is a major player in the nuclear power industry, building and refurbishing nuclear power plants.[120]

The Livermore National Laboratory is now managed by Lawrence Livermore National Security, LLC, which includes Bechtel National, the University of California, Babcock and Wilcox, URS, and Battelle. Founded as a non-profit research laboratory, Battelle still has a non-profit corporate form, but has developed into a very large, diversified research and management services firm selling its services mainly to government and to large corporations. It does work in field ranging from health services and environmental planning and compliance to aerospace technology development.[121] In addition to its work for NNSA, Battelle has contracts for the military and the Department of Homeland Security, with its current "national security-related" work totaling about $1.6 billion annually.[122]

The Sandia National Laboratories are operated by Sandia Corporation, a subsidiary of Lockheed Martin, the world's largest arms maker. Sandia's principal facilities are in Albuquerque, New Mexico and across the street from the Livermore National Laboratory in California. The Sandia labs perform a wide range of nuclear weapons research, testing, and engineering functions, and also manufacture radiation-hardened electronic components for nuclear weapons. Sandia also oper-

ates the Tonapah Test range, where aircraft-delivered nuclear weapons are flight and drop tested.[123]

The Y-12 plant, which is the primary site for the manufacture of the bomb and warhead components requiring uranium, is managed by Babcock & Wilcox Technical Services Y-12, a joint enterprise of B&W and Bechtel National. The Pantex plant, where nuclear weapons are assembled and disassembled, is run by Babcock & Wilcox Technical Services Pantex, an LLC that also includes Bechtel National and Honeywell. Honeywell is another top-20 arms maker globally (14th in 2009), and also a diversified industrial and manufacturing company working in industries from petrochemicals to automobile components to consumer products packaging.[124] The Kansas City plant, where non-nuclear components are manufactured, also is managed by Honeywell.[125]

The Nevada Test Site, used for a variety of military testing using hazardous materials in addition to nuclear weapons-related tests, is managed by National Security Technologies, LLC, a joint venture of Northrop Grumman, AECOM, CH2M Hill, and Nuclear Fuel Services. Nuclear Fuel Services, a subsidiary of Babcock and Wilcox, is the main supplier of nuclear reactor fuel for the Navy. It also downblends highly enriched uranium originally produced for nuclear weapons to a form suitable for commercial reactor fuel. AECOM, a Fortune 500 company, is a diversified global engineering, construction, and technical services firm. It also is a major contractor for the Department of Defense, providing world wide airfield engineering services to the Air Force and logistics and base support functions to other services at foreign bases and deployments, particularly in the Middle East. CH2M Hill also is a broad-spectrum engineering and construction company with a long-time specialization in wastewater systems and in environmental cleanup, an area where it has done extensive work for the US nuclear weapons complex.[126]

The Savannah River, South Carolina plant is the main site for tritium operations. The Department of Energy also plans to construct a plant there for the conversion of plutonium for use in mixed-oxide nuclear reactor fuel. Savannah River is operated by Savannah River Nuclear Solutions, LLC, a joint enterprise of Honeywell, Fluor Corporation, and Newport News Nuclear, Inc., a subsidiary of Huntington Ingalls Industries. Huntington Ingalls is a major military shipbuilder, building and maintaining both nuclear and non-nuclear vessels for the Navy. Fluor is another big military contractor and diversified engineering, construction, and project management firm, providing logistical support for US foreign military operations and bases, and working on projects from the new span of the San Francisco-Oakland Bay Bridge to tar sands petroleum production.[127]

Many of the nuclear weapons site contractors also provide environmental cleanup and remediation services to the Department of Energy for the sites they manage or for closed facilities of the larger Cold War nuclear weapons complex. The large engineering firms, such as Bechtel, Flour, and CH2M Hill, for example, all do significant amounts of environmental remediation work for DOE.

The nuclear weapons and nuclear power industries in the US also have been intertwined since their inception. Several of the main contractors for the US nuclear weapons research and production complex also are major commercial nuclear energy companies. Bechtel is a leading nuclear construction and engineering firm, building or providing support services for a significant share of the 104 nuclear power reactors in the US and doing additional nuclear work abroad. Flour also has built a number of nuclear power plants and provides maintenance and engineering services for many more. Babcock and Wilcox is a long-time designer and manufacturer of major commercial nuclear power plant components. The US nuclear weapons laboratories and production plants also have been and continue to be major centers of commercial nuclear power research. The nuclear weapons industry provides the large nuclear companies with a significant research and industrial base, together with a reliable income stream when the prospects for nuclear power dim (in particular when major nuclear accidents bring the dangers of the technology back to public consciousness). B&W and Bechtel, for example, are partners in developing small modular nuclear reactors as an alternative to large nuclear plants, drawing on both company's extensive history in the industry and in particular on B&W's experience in naval nuclear reactors. Part of the current plan for encouraging the development of small modular reactors is for the US government to jump start demand by considering them for use to provide power for government facilities such as Department of Energy sites and Department of Defense installations.[128]

THE NUCLEAR WEAPONS AND NUCLEAR POWER INDUSTRIES IN THE US ALSO HAVE BEEN INTERTWINED SINCE THEIR INCEPTION. SEVERAL OF THE MAIN CONTRACTORS FOR THE US NUCLEAR WEAPONS RESEARCH AND PRODUCTION COMPLEX ALSO ARE MAJOR COMMERCIAL NUCLEAR ENERGY COMPANIES.

The delivery systems for US nuclear weapons are made and maintained by agglomerations of corporate contractors and subcontractors. Webs of subcontractors for particular systems often are scattered across many states and congressional districts, a proven way to cement support in a political system in which military spending has been one of the few forms of government industrial policy capable of gaining any consistent consensus.

The prime contractors for all systems are one or another of the US-based companies that constitute four

of the top five arms makers in the world: Lockheed Martin, Boeing, Northrup Grumman, and General Dynamics. Boeing is the prime contractor for the B-52 bomber, the Minuteman III ICBM, the air launched cruise missile, and the F-15E strike aircraft (originally made by McDonnell Douglas prior to its merger with Boeing). Lockheed Martin is the prime contractor for the Trident D-5 SLBM, the F-16, and the F-35, the strike aircraft expected eventually to replace both the F-16 and F-15E in carrying non-strategic B61 nuclear bombs. Northrop Grumman is the prime contractor for the B-2 Stealth Bomber, and General Dynamics is the prime for the Ohio class ballistic missile submarines.[129]

All of the dominant arms makers have large and diverse military portfolios, albeit with different emphases. As the world's largest arms maker, Lockheed Martin's various business units make a wide range of weapons and military systems, from combat ground vehicles, ships and aircraft to missiles and missile defense systems. As noted earlier, a Lockheed Martin subsidiary also manages the Sandia Laboratory, which does nuclear weapons system engineering and makes non-nuclear components of nuclear weapons systems. Northrop Grumman also has a broad base in military contracting, but is strongest in aerospace, including manned and unmanned aircraft, missiles, satellites, and missile defense systems. Boeing is mainly an aerospace company, producing and maintaining aircraft, missiles, rockets, and missile defense systems, satellites, and a wide range of associated weapons, electronics, and communications systems. As one of the world's largest producers of commercial aircraft, it has a higher proportion of non-military sales than the other top arms makers. General Dynamics is the main US shipbuilder for submarines, builds surface combat ships, makes ground combat vehicles and a variety of ordnance, and has a civilian aerospace business specializing in business jets.[130]

The major contractors subcontract on each others programmes, and also employ layer upon layer of further subcontractors, reaching deep into the fabric of American economic, cultural, and political life. A short sampling of institutions that engage in smaller but still significant amounts of military work suggests the breadth and depth of this phenomenon. General Electric (GE), one of the leading manufacturers of both commercial and military aircraft engines in the world. Although no longer a leading nuclear weapons contractor, it makes the engines for the B-2 bomber. GE ranks number six on the list of America's largest 500 corporations.[131] It manufactures a broad range of goods ranging from consumer products like digital cameras and refrigerators to turbines for electrical generating plants. It has a large financial subunit, GE Capital, and owns NBC, one of the major US broadcasting networks.[132] International Business Machines (IBM), a perennial power in the computer industry, and number 18 on the Fortune 500 list, has provided the nuclear weapons laboratories with several generations of supercomputers, central to their efforts to continue nuclear weapons research and design in a post-nuclear testing regime.[133] The Universities of California and Texas, two of the country's largest public university systems, are part of management teams for the principal nuclear weapons design laboratories. University involvement in nuclear weapons contracting brings with it a distinctive set of concerns. The association of public universities with nuclear weapons research and production institutions helps buttress claims to scientific neutrality and of a dedication to the general public good. Military funding of university research, in turn, can have a profound effect on research agendas, on what questions will and will not be answered, across a wide range of disciplines.[134]

Many of the companies that also are large defense contractors have grown along with the American empire, the dominant global economic, political, and military force of the last century, in a way that makes their character and effects hard to disentangle from the shape modernity has taken. The big construction and engineering firms like Bechtel that build the production complexes of the nuclear establishment also built large portions of the global metropole, including key elements of its global resource extraction systems and supply chains from petrochemical infrastructure in the Middle East to airports and port facilities world wide. The immense resources poured into cutting edge weapons and the sophisticated infrastructure that is used to design, deploy, and coordinate them in the field have enabled the leading military contractors in many instances to become major players in civilian business areas such as communications and computing technologies. As US elites have come to preside over an economically polarized nation within an even more stratified world, the militarization of "homeland security" has created new opportunities for the military contractors to exercise their "core competences" and sell their wares. IBM, Lockheed Martin, and General Dynamics, for example, also are top ten Homeland Security contractors.[135] And in a time of economic stagnation, the largest US military contractors, having amassed large cash reserves, are simultaneously hedging against budget cuts and expanding the range of their economic and social power by moving into other industries, such as health care, that offer the promise of rent-like returns.[136]

The nuclear technology complex overlaps the military-industrial complex, but also has an identity in its own right. Its influence over all things nuclear, from nuclear weapons policy to public perceptions about the virtues and dangers of nuclear technologies and the effects of radiation, remains under analyzed. Our lack of adequate understanding on this front may be particularly acute in the realm of nuclear non-proliferation policy, where the same enterprises may have interests

in promoting both nuclear technologies and military technologies purportedly deployed to suppress their spread. The only certainty is that in the United States, as in every nuclear weapon state, decisions about nuclear matters remain among the least democratic, often decisively influenced by processes that lie concealed behind layers of propaganda and secrecy.

ECONOMICS AND DISCOURSE

In late 2010, in order to cement support for New START in the Senate, the Obama administration made a commitment to increase spending for nuclear weapons research, production, and testing and for the maintenance and modernization of nuclear weapons delivery systems.[137] At the time of the Fiscal Year 2012 President's Budget Request submitted to Congress in early February 2011, the administration anticipated spending approximately $88 billion for bombs and warheads and supporting infrastructure and about $125 billion for delivery systems over a ten year period.[138]

By late 2011, however, the budget process was in a shambles. The austerity campaign engaged in with varying degrees of enthusiasm by virtually all elements of the US corporate and political classes had run out of control. Every faction wanted to cut something, but divisions among the oligarchs prevented agreement on what to cut. There also was a strong bloc in Congress determined to prevent any significant increases in taxes on the wealthy or corporations, making significant increases in revenue virtually impossible. The magnitude of the cuts in public spending being bandied about had grown so large that programmes favored by genuinely powerful interests such as the military services and contractors faced a greater than usual chance of reductions. The solution was the design of arcane procedural measures to diffuse political responsibility for the impasse while postponing decisions that might affect any set of interests having real power. This left the political front men of all factions (not to mention the entire political system) further discredited, but averted for the moment measures that might interfere with large organization wealth extraction strategies dependent on the use of federal government power to tax and spend.

If implemented, these measures could reduce future projected military spending, but would not significantly cut into the vast increase in the magnitude of military spending that has occurred over the past decade.[139] Further, the round of military spending reductions mandated by the "sequester" provisions of the August 2011 Budget Control Act do not take effect, if at all, until January 2013. They could be reversed by legislative action at any time, and Congressional advocates of the military-industrial complex have announced their determination to do so.[140]

As austerity campaigning took hold of the mainstream political discourse over the course of 2011, there was some speculation, encouraged in part by occasional comments from official sources, that the Obama administration was, and perhaps still is, contemplating more structurally significant cuts US nuclear forces, such as the elimination of one of the three legs of the nuclear triad. This speculation was given further support by the initiation of an internal review of nuclear weapons policies and plans, including the operational war and targeting plans that ultimately determine what the military sees as its requirements for numbers and types of nuclear weapons and delivery systems.[141] Information leaked about the review suggested the administration was contemplating options as low as 400 warheads. Such cuts, however, apparently were being discussed in the context of reductions that might be negotiated with Russia.[142] Further, the leaks regarding the Obama administration's nuclear review may have been based on a RAND working paper that examined a range of arsenal sizes, but did so in hypothetical combinations with other strategic systems such as prompt global strike weapons and missile defenses.[143]

Public comments regarding possible reductions in nuclear forces by military and civilian officials, however, have been in the context of achieving cost savings over the long run via decisions not to replace existing nuclear weapons delivery systems or by reducing numbers of platforms, e.g. by cutting the number of new ballistic missile submarines to be acquired. These comments typically have been accompanied by reiteration of commitments to retain all current types of delivery systems, likely until the end of their service lives.[144] The likelihood that the nuclear policy reviews currently in progress will make few near-term changes in US nuclear forces was reinforced by the announcement in late January 2012 that the 2013 military budget will make no significant cuts that would affect current US nuclear weapons systems. For FY 2013 and after, the Obama administration is proposing a pre-sequester budget plan in which military spending would dip less than one percent the first year, and then resume its steady growth thereafter.[145] The Defense Department in late January issued an overview document titled "Defense Budget Priorities and Choices" outlining the major programme decisions informing the spending levels. That document announced a continued commitment to all three legs of the nuclear "triad": land-based ICBMs, SLBMs, and strategic bombers. It also reaffirmed plans for a new long-range bomber. The only apparent cost-cutting measure affecting nuclear weapons programmes was a two year delay in the planned replacement of the Ohio class ballistic missile submarines.[146]

The "Defense Budget Priorities and Choices" document also gave new life to a submarine-launched conventional prompt global strike weapon, listing as a priority "[d]esign of a conventional prompt strike option from submarines." In response to questions on the programme, Chairman of the Joint Chiefs of Staff General

Martin Dempsey suggested to reporters that concepts currently contemplated involved missiles that would move at a speed and with a trajectory that would make them distinguishable from a ballistic missile, thus solving problems of nuclear ambiguity that previously had concerned Congress enough to limit "prompt global strike" weapons launched from ballistic missile submarines.[147] Eliminating the danger of confusion that a launch might be nuclear, however, does not mitigate the impact on the global strategic balance of new kinds of powerful, accurate conventional weapons that can be launched from stealthy undersea platforms and which would be capable of hitting any country on earth far more quickly than existing conventional delivery systems such as cruise missiles and aircraft.

In sum, the Obama administration appears for the near term to be remaining on the course of modernization of nuclear weapons systems and of the facilities that build and maintain them that it committed to in the context of its effort to obtain Senate consent to New START. There may be further changes at the margins to control costs, particularly for programmes such as major systems acquisitions and construction projects where costs are prone to spiral out of control. Pushing back the schedule for replacement ballistic missile submarine acquisition was one such change; the moratorium on construction of the CMRR-NF at Los Alamos (perhaps also the facility most vulnerable to cancellation) is another. But the broader modernization thrust remains, with little in the way of changes that might reduce the diversity of capabilities and destructive capacity of the US arsenal on the planning horizon before the current delivery systems begin to be replaced—or not—in the 2030s. There is no reason to expect significant disarmament initiatives from Congress, where pro-nuclear weapons factions remain strong, particularly on the committees with the most influence on relevant parts of the federal budget.[148]

IN SUM, THE OBAMA ADMINISTRATION APPEARS FOR THE NEAR TERM TO BE REMAINING ON THE COURSE OF MODERNIZATION OF NUCLEAR WEAPONS SYSTEMS AND OF THE FACILITIES THAT BUILD AND MAINTAIN THEM THAT IT COMMITTED TO IN THE CONTEXT OF ITS EFFORT TO OBTAIN SENATE CONSENT TO NEW START.

In the broader populace, there is little debate about US nuclear weapons policies or spending. Thirty years on from the outpouring of disarmament sentiment that brought a million people out to protest in Central Park, little is left in the way of a disarmament movement in the United States. What remains is a scattering of organizations, some more towards the "arms control" end of the spectrum that always were part of the political mainstream and some that are institutionalized remnants of movements past. The former always have pursued a remedial and incrementalist politics. Most who work in the latter have come to believe that they have no choice. This dynamic reflects far broader changes in the US economic, social, and political environment, affecting how social change work is done across the board, and even whether work on issues of general public concern is perceived and described as working for social change.

What public discussion there is about US nuclear weapons policy is dominated by specialists. Actual nuclear disarmament is conceived as a distant, aspirational goal. There is very little debate, discussion, or serious analysis of what kinds of strategies for social, economic, or political change would be necessary to accomplish it. In the absence of a movement with a convincing vision of the path to nuclear disarmament or the political power to support it, most disarmament-related advocacy is reactive. US arms control and disarmament groups focus mainly on preventing the expansion of nuclear weapons capabilities and budgets, or on taking advantage of what are perceived as opportunities for incremental progress. The common denominator is that the limits to the disarmament agenda are set by what is thought to be achievable in government fora without challenging anything fundamental about the existing order of things, or the role of US military forces in sustaining it.

In the post Cold War era, challenges to the rationale for deployment of US military forces have remained episodic and marginal. There have been significant upsurges of anti-war sentiment occasioned by particular wars, but none have yet coalesced into sustained opposition to the immense permanent military establishment that is a central characteristic of the US economy and polity. In mainstream, Washington, DC-focused arms control and disarmament discourse, "the mission" of the military largely remains in brackets, with debate limited to how it can be achieved most inexpensively and with the least risk. In this context, nuclear weapons are portrayed as less useful and more risky than other weapons, offering less bang for the buck because their fearsome destructiveness limits the circumstances in which they can be used. Elimination of nuclear weapons is framed as a good thing to the extent that the goals of those who have the power to set US military and foreign policy can be achieved without them. What those goals are and who has the power to set them also remains largely outside the frame.[149]

Viewed within this conventional advocacy frame the current austerity campaign by corporate and political elites offers an additional opportunity to advance this narrative. The argument runs that maintaining nuclear weapons over the long run, and particularly building expensive replacements for existing delivery systems, is

likely to require cuts in conventional forces in a climate where, for the first time in over a decade, the military might not be able to get virtually everything it asks for.

Arguments of this kind may rein in nuclear weapons spending to some degree, perhaps even reducing the number of new delivery platforms acquired or delaying or eliminating construction of some new weapons facilities. The main focus of many arms control advocates at this writing seems to be reducing the number of ballistic missile submarines to be acquired (after the Ohio class submarines reach the end of their service life about two decades from now) from twelve to eight, and possibly delaying acquisition of ICBMs and new nuclear-capable bombers.[150]

Demanding more than incremental reductions in the near term is marginalized in a professionalized arms control and disarmament discourse as unrealistic. An alternative "realism" might give more weight to the urgency of reducing arsenals to levels where they no longer can inflict fatal damage on humanity and the ecosphere on a time scale relevant to the deepening crises we face, crises that bear some significant resemblances to those that brought great power wars in the past. This broader realism might also encompass the relationship of the current impasse in disarmament progress to the equally urgent task of war prevention, a task complicated by the repeated use of "non-proliferation" as a stalking horse for geopolitical agendas. Is the danger of great power war on the rise once more in a world of ascending and declining great powers competing for disappearing resources and pursuing ecologically unsustainable growth paths? Amidst the deepest economic crisis of the nuclear age, what constellations of organizations within states benefit from sustained high-tech militarism, and have interests they see as justifying high risk confrontations that could lead to catastrophe? Such questions remain largely outside US arms control and disarmament discourse. Even most disarmament advocates apparently are willing to accept elite assurances that a technocratically managed, interdependent global economy has eliminated the possibility of great power war (just as they assured us it eliminated the business cycle), or perhaps also believe, on some unexamined level, that nuclear deterrence works. Little else explains the pervasive lack of urgency regarding disarmament amongst most who make arms control their occupation.

Reductions in numbers of delivery systems and warheads at some indeterminate future time would be a good thing. It has no necessary relationship, however, to significant progress towards bringing the US nuclear arsenal below the level where it represents an existential threat to humanity. There is no reason to believe that budgetary concerns will override a determination on the part of elites who actually have a say in the matter to keep a "superpower" nuclear arsenal. Post-Soviet Russia suffered an economic decline virtually unprecedented in a modern industrialized country in the absence of major war, and yet its elites chose to hold on to a nuclear arsenal of civilization-destroying size. If one believes that nuclear weapons might in fact be used, nuclear weapons are a relatively cheap way to retain or acquire the ability to destroy an adversary who may be able to field larger or more technologically capable conventional forces.

Like many other countries, the United States, has been sliding deeper into political crisis the longer the global economic crisis has dragged on. Here, as in much of the world, wealth has become concentrated in huge organizations that constitute the top tier of an increasingly divided economy and society. The military-industrial complex and other constellations of corporations, in alliance with government organizations with aligned interests, dominate politics at every level from the local to the national. The US is a country where democracy has long been in decline, eroded by the effects of this concentration of wealth in a political system where money has free play, and by 60 years of national security state ideologies used to justify not only high-tech militarism but a slow, steady stifling of civil society.[151] The rule of law no longer applies to those at the top, and anything beyond the mildest forms of dissent outside channels safely controlled by one or another form of legalized corruption is hemmed in by heavily militarized police. As the 2006 Weapons of Mass Destruction Commission, headed by Hans Blix, put it in its report, "Governments possessing nuclear weapons can act responsibly or recklessly. Governments may also change over time."[152]

From the perspective of incumbent elites struggling to sustain the status quo against challenges within and without amidst deepening crisis, the sense of a world out of control on many fronts provides ideological justification for their habitual version of "caution": remain vigilant, and well-armed. There is little sign that the oligarchs who control the United States, a country that no longer can claim outstanding performance in any social endeavor other than the deployment of high-tech violence, will choose a different course. Having been successful in restricting meaningful access to the political system to the wealthy and powerful, it is also unlikely that change will be forced upon them, in the absence of social movements on a scale far greater than any on the visible political horizon. In the 1960s Pakistan's foreign minister Zulfiqar Ali Bhutto became a symbol of the determination of national elites to acquire nuclear weapons regardless of the consequences for their people with his statement that should India get nuclear weapons, "[e]ven if Pakistanis have to eat grass we will make the bomb."[153] In Prague in 2009, President Obama, like many presidents before him, stated a belief that nuclear disarmament might be a good idea on some distant day, but reaffirmed a promise that every time has proved to be the concrete reality:

"As long as these weapons exist, the United States will maintain a safe, secure and effective arsenal to deter any adversary."[154] Unless there are profound changes in the structure of US politics, economics, and society, it is likely that many millions of Americans will be eating grass long before the US stops striving for global military dominance, much less begins moving towards nuclear disarmament.

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