



ASSURING DESTRUCTION FOREVER: 2017 EDITION

WOMEN'S INTERNATIONAL LEAGUE FOR
PEACE & FREEDOM



TABLE OF CONTENTS

Introduction	4
China	6
France	8
India	10
Israel	12
Pakistan	14
Russia	16
United Kingdom	19
United States	22

Introduction

It's 2017 and there are about 14,900 nuclear weapons in the world.² The detonation of even a fraction of these weapons would destroy the planet and end human civilisation as we know it.³ Yet even now, nearly twenty years into the twenty-first century, with all of our understanding of the catastrophic consequences of nuclear weapons and the global economic and climactic strains on our existence, some states are investing in a nuclear arms race.

China, the Democratic People's Republic of Korea (DPRK), France, India, Israel, Pakistan, Russia, the United Kingdom, and the United States all possess the capacity to detonate nuclear explosive devices. The DPRK's programme is relatively recent and in development,⁴ but the rest of these states have had nuclear weapons for decades. They are now all "modernising" their arsenals of warheads and delivery systems. Some are also expanding the size of their arsenals.

These "modernisation" programmes are not, as this study has shown since in its first edition in 2012, just about "increasing the safety and security" of nuclear arsenals, which is what the governments of these countries claim. The "upgrades" in many cases provide new capabilities to the weapon systems. They also extend the lives of these weapon systems beyond the middle of this century, ensuring that the arms race will continue indefinitely.

Modernisation of nuclear weapons is driven largely by the quest for military advantage.

Nuclear "deterrence" requires the threat of the use of nuclear weapons to be credible, and preparations for such use, legitimate.

Modernisation, especially if new capacities are created, refreshes the perceived utility and credibility of nuclear use, both technically and politically. The only way to prevent states from modernising their nuclear weapons is to prohibit and eliminate the weapons.

A treaty to prohibit nuclear weapons is currently in development.⁵ This treaty will hopefully make investments in nuclear weapon modernisation, and inclusion of nuclear weapons in security doctrines, increasingly difficult. By finally outlawing nuclear weapons the same way other weapons of mass destruction, biological and chemical, have been outlawed, the perceived "legitimacy" of the possession and modernisation of nuclear weapons will be stripped away.

In the meantime, states are already legally obligated to achieve nuclear disarmament. Article VI of the Non-Proliferation Treaty (NPT) obligates all states parties to "undertake to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament." Nuclear weapon modernisation is the qualitative aspect of the "nuclear arms race". Forty-seven years ago the NPT required this practice to end "at an early date," an outcome the Treaty paired with "good faith" progress toward nuclear disarmament. The NPT, especially as unanimously and authoritatively interpreted by the International

Court of Justice, requires nuclear disarmament.⁶ The illegitimacy of nuclear weapons is a foundation of the NPT.

Thus nuclear weapon modernisation goes against the letter and spirit of international law. These programmes are also absurd and immoral, in light of the known consequences of their use and in light of the economic, social, and environmental crises we collectively face. The nine states possessing nuclear weapons, and the countries that support the modernisation and perpetuation of their arsenals by including nuclear weapons in their security doctrines, are all complicit in this horrific threat to the planet.

These states' failure to meet their legal obligation to end the nuclear arms race and eliminate their arsenals must be met with resolve for concrete action by non-nuclear-armed states so as to avoid further entrenchment of the indefinite possession of nuclear weapons. All governments have the

responsibility to prevent a humanitarian and environmental tragedy. The nuclear weapon ban treaty is a step in the right direction, particularly in so far as it can impede modernisation programmes and help to facilitate and compel the elimination of nuclear weapons.

This publication is an update of a study *Reaching Critical Will* initiated in 2012, funded by the Ministry of Foreign Affairs of Austria, on the nuclear weapon modernisation programmes of the nuclear-armed states. Each chapter is authored by country experts. Updates of the executive summary were released in 2013 and 2014, and a revised edition of the full study was published in 2015. Those editions can be found at www.reachingcriticalwill.org. The 2017 version is a summary update, with primary research undertaken by the editor and inputs from the authors. We recommend reviewing the 2015 edition for more complete overviews of the modernisation programmes underway.

Notes

1. With thanks to Greg Mello and Trish Williams-Mello for their contributions to the 2015 version of this introduction.
2. Hans M. Kristensen and Robert S. Norris, "Status of World Nuclear Forces," Federation of American Scientists, retrieved 15 April 2017, <https://fas.org/issues/nuclear-weapons/status-world-nuclear-forces>.
3. For details on the environmental and humanitarian consequences of nuclear weapons, please see *Unspeakable suffering: the humanitarian impact of nuclear weapons*, Reaching Critical Will of the Women's International League for Peace and Freedom, 2012, <http://www.reachingcriticalwill.org/images/documents/Publications/Unspeakable/Unspeakable.pdf>.
4. The Democratic People's Republic of Korea is not included in this study.
5. See <http://www.reachingcriticalwill.org/disarmament-fora/nuclear-weapon-ban> for details.
6. *Legality of the Threat or Use of Nuclear Weapons*, Advisory Opinion of 8 July 1996, International Court of Justice, 105(2)F.

China

As of its 2015 defence white paper, China has maintained a no-first-use doctrine for nuclear weapons. However, it's modernisation programme "is adding significant new capabilities" to its nuclear forces.¹ The white paper asserts that China will "press forward with independent innovations in weaponry and equipment by reliance on science and technology, enhance the safety, reliability and effectiveness of missile systems, and ... strengthen its capabilities for strategic deterrence and nuclear counterattack, and medium- and long-range precision strikes."² US "missile defence" plans have reportedly been a driving forcing for China's nuclear weapon modernisation, as some Chinese officials are concerned that even a limited "missile defence" system could neutralise China's nuclear force. For example, China has begun to equip its silo-based missiles with the capability to carry multiple warheads.³

Current status

The Federation of American Scientists (FAS) estimates that China has a total stockpile of approximately 260 nuclear warheads for delivery by about 150 land-based ballistic missiles, 48 sea-based ballistic missiles, and bombers. FAS also estimates that China's intercontinental ballistic missile force is continuing to grow slowly.⁴

Development and "modernisation"

The 2015 white paper explains that China is continuing to "optimize its nuclear force structure, improve strategic early warning, command and

control, missile penetration, rapid reaction, and survivability and protection." Its modernisation programme began in the 1990s and is includes transitioning from liquid-fueled slow-launching missiles to solid-fuel, quicker-launching road-mobile missiles, to make the force more "useable".

In recent years, China has been phasing out its older missiles, the DF-3A and DF-4, and replacing them with new ones (DF-21 and DF31).⁵ It may also be developing a new road-mobile intercontinental ballistic missile, the DF-41, possibly capable of carrying multiple independently targetable re-entry vehicles (MIRVs).⁶

Recently China has also sped up the modernisation of its sea-based strategic force, replacing its first generation ballistic nuclear missile-carrying submarines (SSBNs).⁷

Some analysts have also argued that China is currently modernising its sea-based strategic force in order to secure a second-strike force.⁸ FAS reports that it is not known how many SSBNs China is planning to build, but that the Jin-class submarines are designed to carry a new JL-2 ballistic missile, which has not yet been tested to its full range (7000km).⁹

Budget

It is difficult to estimate the cost of China's nuclear weapon force; however, assuming that China consistently maintains five percent of its overall military expenditure for its nuclear

weapons programme,¹⁰ China would have spent about 7.3 billion USD on its nuclear programme in 2016 (assuming an overall budget of 146 billion USD¹¹). According to a new report in *Jane's*, China's military spending is on course to nearly double to 233 billion USD by 2020.¹²

Perspective

China is one of the least transparent of the nuclear-armed states. China contends the opacity of its force posture can serve to enhance the "deterrence effect" of its smaller nuclear force. There is scant public debate about nuclear

weapons in China. After US President Obama outlined his "vision" of a nuclear weapon free world, an online survey conducted by the *People's Daily* indicated that 51 percent of respondents wanted nuclear disarmament while 49 percent did not.¹³

The original chapter upon which these updates are based was written by Hui Zhang, a Senior Research Associate at the Project on Managing the Atom in the Belfer Center for Science and International Affairs at Harvard University's John F. Kennedy School of Government. Updates by Ray Acheson.

Notes

1. Hans M. Kristensen and Sam R Norris, "Chinese nuclear forces, 2016," *Bulletin of the Atomic Scientists*, Vol. 72, No. 4, p. 205.
2. "China's Military Strategy," Ministry of National Defense, The People's Republic of China, 26 May 2015, http://eng.mod.gov.cn/Press/2015-05/26/content_4586805_4.htm.
3. Kristensen and Norris, op. cit.
4. Kristensen and Norris, op. cit.
5. Hui Zhang, "China's Nuclear Weapons Modernization: Intentions, Drivers, and Trends", Kennedy School of Government Harvard University, July 2012, <http://belfercenter.ksg.harvard.edu/files/ChinaNuclearModernization-hzhang.pdf>.
6. "Annual Report to Congress – Military and Security Developments Involving the People's Republic of China 2014," Office of the Secretary of Defense, 24 April 2014, http://www.defense.gov/pubs/2014_DoD_China_Report.pdf.
7. Ibid.
8. Hui Zhang, op. cit.
9. Kristensen and Norris, op. cit., p. 208.
10. See, e.g. Brigadier Vijai K Nair, "China's Nuclear Strategy and Its Implications For Asian Security," *China Brief*, Vol 4, Issue 3, 4 February 2004.
11. Chris Buckley and Jane Perlez, "China Military Budget to Rise Less Than 8%, Slower Than Usual," *The New York Times*, 4 March 2016.
12. Alanna Petroff, "China's defense spending to double to \$233 billion," *CNN*, 12 December 2016.
13. For instance, Guo Qiang, "US' nuke-free world plan stirs debate," *Global Times*, 24 September 2009.

France

Like all of the other nuclear-armed states, France is in the middle of a broad modernisation of its nuclear forces involving submarines, aircraft, missiles, warheads, and production facilities. Studies of next-generation weapon systems have begun. Having reduced its air-delivered nuclear forces by one-third in 2008, France does not appear to have plans to reduce its nuclear forces for the foreseeable future. The Hollande government has rejected further cuts and reaffirmed the existing nuclear posture.

Current status

France possesses approximately 300 nuclear warheads, approximately 290 of which are deployed or operationally available for deployment on short notice.¹ Its delivery vehicles include about 40 aircraft assigned a total of 54 cruise missiles; and four nuclear-powered ballistic missile submarines (at least two of which are always fully operational) equipped with nuclear-armed long-range ballistic missiles.² Former president Nicolas Sarkozy stated in 2008 that the French nuclear “arsenal will include fewer than 300 nuclear warheads” and that it “has no other weapons beside those in its operational stockpile.”³ But in February 2015, President François Hollande stated that the stockpile included 300 warheads for 48 submarine-launched ballistic missiles (SLBMs) and 54 cruise missiles.⁴

Development and “modernisation”

France has retired its M45 sea-launched ballistic missiles, replacing them with the M51 on its four

Triumphant-class submarines. It is currently upgrading the fourth SSBN to the M51. Each missile carries six independently targetable re-entry vehicle (MIRV) TN75 thermonuclear warheads.⁵

In February 2015, President Hollande announced a decision to develop a SLBM to arm a next-generation SSBN of about the same size as the current Triumphant-class SSBN.⁶ Hollande also declared studies have been carried out for a next-generation air-launched cruise missile,⁷ tentatively known as ASN4G.⁸ Half of the land-based nuclear bomber force has been upgraded to Rafale, and by 2018 the Rafale will also replace the remaining Mirage 2000Ns at Istres Air Base. That same year, the first two of a fleet of 12 Phoenix-class Airbus tankers will be deployed at Avon Air Base.

Budget

The French government has indicated that it spends approximately 4.6 billion USD on its nuclear forces each year,⁹ though other sources suggests it spends 3.6 billion USD annually.¹⁰ However, due to increasing costs of the modernisation programme, it is estimated that by 2025 that budget will be nearly doubled to 6 billion USD.¹¹

Perspective

Despite France’s obligation to pursue negotiations toward nuclear disarmament, President Hollande declared in 2015 that “the time of the nuclear deterrent is not a thing of the past. There can be

no question of lowering our guard, including in that area.”¹² Moreover, Hollande said it is French policy that, “If the level of other arsenals, particularly those of Russia and the United States, were to fall one day to a few hundred weapons, France would respond accordingly, as it always has. But today, that scenario is still a long way off.”¹³ These statements, together with the pledge to continue to modernise French nuclear forces,

appears to be in conflict with France’s obligations under the NPT to negotiate disarmament. There is scant debate in France over the composition or cost of its nuclear forces.

The original chapter upon which these updates are based was written by Hans Kristensen, Director of the Nuclear Information Project at the Federation of American Scientists. Updates by Ray Acheson.

Notes

1. Speech by Nicolas Sarkozy, President of France, Presentation of Le Terrible in Cherbourg, 21 March 2008.
2. Status of World Nuclear Forces, Federation of American Scientists (FAS), June 2011.
3. Speech by Nicolas Sarkozy, President of the French Republic, Presentation of Le Terrible in Cherbourg, 21 March 2008, p. 8. A copy of the French version is available here: <http://www.elysee.fr/president/root/bank/pdf/president-1944.pdf>
4. Speech by François Hollande, Visit to the Strategic Air Forces, 25 February 2015, p. 9, <http://basedoc.diplomatie.gouv.fr/vues/Kiosque/FranceDiplomatie/kiosque.php?fichier=baen2015-02-25.html>.
5. Julien Bonnet, “Tir d’essai réussi pour le missile nucléaire M51,” L’Usine Nouvelle, 1 July 2016; “Successful M51 Ballistic Missile SLBM Test by French Defense Procurement Agency DGA,” Navy Recognition, 30 September 2015.
6. Speech by François Hollande, Visit to the Strategic Air Forces, 25 February 2015, <http://basedoc.diplomatie.gouv.fr/vues/Kiosque/FranceDiplomatie/kiosque.php?fichier=baen2015-02-25.html>.
7. Ibid.
8. Jean-Yves Le Drian, Defense Minister, Closing Remarks – Symposium for 50 Years of Deterrence, 20 November 2014, <http://www.defense.gouv.fr/ministre/prises-de-parole-du-ministre/prises-de-parole-de-m.-jean-yves-le-drian/discours-de-cloture-du-colloque-pour-les-50-ans-de-la-dissuasion>.
9. National Assembly, Defense Committee, AVIS, PRÉSENTÉ AU NOM DE LA COMMISSION DE LA DÉFENSE NATIONALE ET DES FORCES ARMÉES, SUR LE PROJET DE loi de finances pour 2012 (n° 3775), TOME VII, DÉFENSE ÉQUIPEMENT DES FORCES – DISSUASION, PAR M. FRANÇOIS CORNUT-GENTILLE, 25 October 2011, <http://www.assemblee-nationale.fr/13/pdf/budget/plf2012/a3809-tVII.pdf>.
10. Par Jean Guisnel, “Le casse-tête financier de la modernisation de la dissuasion nucléaire,” Le Point, 12 May 2016; Paul Soye, “Can France Still Afford Nuclear Weapons?” The National Interest, 7 September 2016.
11. Ibid.
12. Speech by François Hollande, Visit to the Strategic Air Forces, 25 February 2015, <http://basedoc.diplomatie.gouv.fr/vues/Kiosque/FranceDiplomatie/kiosque.php?fichier=baen2015-02-25.html>.
13. Ibid.

India

The focus of India's attempt to modernise its nuclear forces is the development of a full nuclear-triad of delivery systems. Its overall military budget is also consistently increasing due to overall military "modernisation". There is some evidence that the government might be rethinking its commitment to a no-first-use policy, which it has maintained since 1999, but this is hotly debated.¹ The pressures for changing the posture arise from attempts by military strategists to come to terms with the different balance of power in south Asia following the Kargil war, in particular to a doctrine sometimes called Cold Start, which involves plans to quickly attack Pakistan.

Current status

India is estimated to have 110–120 nuclear warheads and to have produced approximately 540 kilograms of weapon-grade plutonium, enough for 135 to 180 nuclear warheads. It currently maintains two to three squadrons of nuclear-capable fighter-bombers and four types of land-based nuclear-capable missiles.²

Development and "modernisation"

India has been increasing the diversity, range, and sophistication of its nuclear delivery vehicles. The latest of the missiles in this series is the three-stage, 5,000-kilometer range Agni-V, which is fired from what is described as a canister rather than a fixed concrete launch pad.³ The significance of this firing mode relates to its ability to improve its second-strike capabilities.⁴ India most recently test-fired the Agni-V in

December 2016. It is reportedly also working to develop the Agni-VI, which will likely be armed with multiple warheads.⁵

In March 2017, India conducted a test launch of an extended range version of the BrahMos supersonic cruise missile.⁶ This follows its development of the Nirbhay cruise missiles, first tested successfully in 2014.⁷ The first test of a 3500-kilometer range submarine-launched ballistic missile named K-4 was carried out in March 2014.⁸ India's first nuclear submarine, Arihant, began "sea acceptance trials" in December 2014, having earlier "passed its harbour acceptance trials."⁹ In March 2016, the K-4 missile was tested from the Arihant¹⁰ and again in January 2017.¹¹

Budget

The expansion of India's nuclear and missile arsenals is part of a larger military build-up and consistently-increasing military spending. However, there is no reliable public estimate on nuclear weapon spending in India. In February 2017, India's finance minister announced a 10 percent increase in the country's defence budget, which is the second consecutive increase of over 10 percent. These increases are driven by the "ongoing modernisation drive in military hardware".¹²

Perspective

By and large, the discourse surrounding development, modernisation, and expansion of the Indian nuclear arsenal involves jubilation about

India becoming a militarily powerful state. Media articles often obsess over how few countries possess one or the other of the many destructive capabilities—nuclear submarines, anti-satellite weapons, submarine-launched ballistic missiles, and so on—and extol India for becoming “one of the elite”. Like national security elites everywhere, Indian security policy makers have used secrecy as a weapon to quash independent questions, increasingly clamping down on the reporting of various details arbitrarily deemed secret. In recent years, the traditional three-way

competition between India, Pakistan, and China has been transformed by the involvement of the United States, which has involved India in an effort to balance and contain a rising China.¹³

The original chapter upon which these updates are based was written by MV Ramana, Simons Chair in Disarmament, Global and Human Security at the Liu Institute for Global Issues at the University of British Columbia. Updates by Ray Acheson and MV Ramana.

Notes

1. Muhammad Faisal et al, “#Nukefest2017 hot takes: potential Indian nuclear first use?” *South Asian Voices*, 20 March 2017, <https://southasianvoices.org/sav-dc-nukefest2017-potential-indian-nuclear-first-use>.
2. Hans M. Kristensen and Robert S. Norris, “Indian nuclear forces, 2015,” *Bulletin of the Atomic Scientists*, Vol. 71, No. 5, November 2015, pp. 77–83.
3. M. Somasekhar, “Agni-V: A Game Changer in India’s Missile Technology,” *The Hindu Business Line*, 31 January 2015.
4. Shiv Aroor, “My Job Is to Speed up India’s Nuclear Strike Time, DRDO Chief Says,” *Daily Mail India*, 3 July 2013.
5. Rajat Pandit, “Agni-V with China in range tested; next in line is Agni-VI, with multiple warheads,” *The Times of India*, 27 December 2016.
6. Franz-Stefan Gady, “India Test Fires Supersonic Cruise Missile,” *The Diplomat*, 15 March 2017.
7. Rishi Iyengar, “India Tests First Nuclear-Capable Cruise Missile,” *Time*, 17 October 2014.
8. Daily Bhaskar, “3,000 Km-Range SLBM Successfully Test-Fired by DRDO,” *Daily Bhaskar*, 13 May 2014; TNN, “India Tests New Underwater Nuclear Missile.”
9. TNN, “INS Arihant Embarks on Its First Sea Trials,” *The Times of India*, 16 December 2014.
10. Hermant Kumar Rout, “Maiden Test of Undersea K-4 Missile From Arihant Submarine,” *The New Indian Express*, 9 April 2016.
11. Hermant Kumar Rout, “India set to launch another nuke missile on January 31st,” *The New Indian Express*, 23 January 2017.
12. Reuters, “India’s defence budget hiked 10pc to INR 2.74 trillion,” *Dawn*, 2 February 2017.
13. Zia Mian and MV Ramana, “Asian War Machines,” *Critical Asian Studies* 46 (2): 345–60.

Israel

Israel's position of opacity means it has no public nuclear weapon doctrine. Far more is known about its approach to modernisation in the most general terms and in the military context than about its approach to nuclear weapons. Whatever factual information is publicly available relies on sources outside of Israel.

Current status

Estimates about the size of Israel's nuclear arsenal are based on the power capacity of the nuclear reactor near Dimona. Experts and analysts outside of Israel estimate that Israel's current nuclear force ranges from 60–80 weapons at the low end to over 400 at the high end. The most recently cited figure is 80 warheads.¹ It is estimated that Israel could have produced approximately 840kg of weapons-grade plutonium.² Estimates of highly enriched uranium (HEU) production are even more difficult to make though public information suggests Israel has a uranium enrichment programme.³ A recent estimate has assumed Israel possesses approximately 300kg of HEU.⁴

It is assumed that Israel has a triad of delivery systems: land, air, and sea. The country is believed to have deployed a cumulative total of 100 Jericho-I (500 km range) and Jericho-II (1,500 km range) ballistic missiles, both of which are nuclear capable as well as mobile by land or rail. The range of the Jericho-II and its 1,000 kg payload "make it well suited for nuclear delivery."⁵

Development and "modernisation"

In light of current and planned nuclear capabilities, it seems that Israel is continuing to "enhance" its triad of delivery systems.⁶ Nuclear weapons modernisation is related to modernisation activities in the security sector generally, including in areas of information technology, advanced military technology, and outer space technology.

Israel has been developing a new ballistic missile, the Jericho-III, which is believed to have a maximum range of 4,000–6,500km.⁷ Foreign sources reported a test of the missile in 2013.⁸ More recent information is difficult to find though some media reports have suggested the Jericho-III is operational.⁹

Budget

There is no reliable public estimate on nuclear weapon spending in Israel.

Perspective

The policy of opacity entails a nuclear weapon capability about which "everyone knows" (domestically and internationally) and an umbrella of secrecy covering the physical and doctrinal elements of this capability. The secrecy surrounding Israel's nuclear programme has taken on a life of its own at the domestic level with Israelis practicing self-censorship on a wide range of nuclear issues. At the same time, a discourse does exist at the academic level and increasingly in the media, driven in large part by debate over

Iran's nuclear programme. This discourse relies primarily on foreign sources. Historically, public opinion polls have indicated support for the nuclear option though a new survey has indicated that 65 percent of Israelis would prefer a nuclear weapon free Middle East to the current situation.¹⁰

The original chapter upon which these updates are based was written by Merav Datan, an international lawyer, former adjunct professor at Rutgers Law School, and former director of WILPF's New York office. Updates by Ray Acheson.

Notes

1. Stockholm International Peace Research Institute (SIPRI), *SIPRI Yearbook 2013: Armaments, Disarmament and International Security - Summary*, Stockholm, 2013, p. 13. See also Hans M. Kristensen and Robert S. Norris, Global nuclear weapons inventories, 1945–2013, *Bulletin of the Atomic Scientists*, September 2013, p. 80.
2. *Global Fissile Material Report 2013: Increasing Transparency of Nuclear-warhead and Fissile-material Stocks as a Step Toward Disarmament*, International Panel on Fissile Materials, October 2013, p. 18.
3. *Nuclear Programmes in the Middle East: In the Shadow of Iran*, International Institute for Strategic Studies (IISS), London, 2008, p. 132, citing David Albright, "ISIS Estimates of Unirradiated Fissile Material in De Facto Nuclear Weapon States, Produced in Nuclear Weapons Programs," Institute for Science and International Security (ISIS), Washington, 2003 (revised 2005); ISIS, Israeli Military Stocks of Fissile Material As of Late 2003 (revised 2005), <http://isis-online.org/isis-reports/detail/israeli-military-stocks-of-fissile-material-as-of-late-2003/>.
4. *Global Fissile Material Report 2013: Increasing Transparency of Nuclear-warhead and Fissile-material Stocks as a Step Toward Disarmament*, International Panel on Fissile Materials, October 2013, p. 11.
5. IISS, *op. cit.*, pp. 132-133, citing Joseph Cirincione, *Deadly Arsenals: Nuclear, Biological, and Chemical Threats*, second edition, Washington, 2005, p. 261.
6. Ian Kearns, *Beyond the United Kingdom: Trends in the Other Nuclear Armed States*, Discussion Paper 1 of the BASIC Trident Commission, London, 2011, p. 28.
7. IISS, *op. cit.*, 133.
8. Alon Ben-David, "Israel Tests Enhanced Ballistic Missile," *Aviation Week*, 29 July 2013.
9. See for example "Agni V And Other ICBMs: Where Does India Stand In The World?" *News18.com*, 26 December 2016; "Netanyahu pays visit to strategically positioned Azerbaijan," *Frontpage Mag*, 16 December 2016.
10. Yitzhak Benhorin, "We'll give up nukes if Iran does same," *Yediot Achronot*, 1 December 2011.

Pakistan

Pakistan is actively expanding its stockpile of warheads, delivery systems, and fissile materials. How much the force expands will depend on demands from its three different military services, as Pakistan is seeking to build land, air, and sea-based nuclear weapon delivery capabilities, as well as on pressure from the fissile material and delivery system production complexes, which have been making major investments in recent years. The government has sought to create a positive public image of the nuclear weapon programme by linking it to national pride and identity, and as a deterrent to attack from India.

Current status

It is estimated that as of 2017, Pakistan has 130–140 nuclear warheads.¹ This arsenal now includes early weapons based on highly enriched uranium (HEU) and a growing fraction of lighter and more compact plutonium-based weapons. Its estimated stockpile of HEU and plutonium is significantly larger, and could be sufficient for perhaps 200 weapons.²

Pakistan has fielded short-range (60–250km), medium range (750–950km), and longer-range (1250–1500km) road-mobile ballistic missiles, as well as ground-launched and air-launched cruise missiles (with ranges from 350–700km) that are capable of delivering a nuclear warhead.

It also uses F-16 and Mirage aircraft as nuclear bombers. Pakistan may seek to make its Chinese-supplied JF-17 fighter jets nuclear-capable.

Development and “modernisation”

The growth of the size of the arsenal appears to have been steady for most of the past decade but it is expected to increase at a faster rate in coming years. There has been a rapid expansion in plutonium production capacity; Pakistan now has four plutonium production reactors, the newest of which began operating in 2015.

New missile systems are also expected to move from development to deployment. Its road-mobile ballistic missiles have been in development and expansion over the past decade. Pakistan’s longest-range ballistic missile, the Shaheen-3, with a range claimed to be 2750km, was tested twice in 2015.

Major new capabilities are under development. In January 2017, Pakistan tested the Ababeel missile with multiple independently targeted reentry vehicles (MIRVs) and a range of 2200km.³ Pakistan also carried out the first test from an “underwater mobile platform” of a “nuclear-capable submarine-launched cruise missile”, Babur-III, with a range reported as 450km.⁴

Budget

There is almost no information about the funding of Pakistan’s nuclear weapons programme. It is clear that a significant fraction of Pakistan’s financial resources go to its nuclear weapons, but that this cost is not a large share of its overall military spending. Assuming that like overall military spending, nuclear weapons spending, has

kept pace with increases in gross domestic product, Pakistan may spend an estimated US\$4 billion a year on nuclear weapons.⁵ Despite extensive foreign military assistance, Pakistan's effort to sustain its conventional and nuclear military programmes has come at increasingly great cost to the effort to meet basic human needs and improve living standards and the country continues to rely on extensive bilateral and international economic aid.

Perspective

To prevent international and public pressure to limit its ambitious nuclear weapons development goals, Pakistan has blocked negotiations of a

fissile material cut-off treaty at the Conference on Disarmament.⁶ A long-term concern now driving Pakistan's nuclear programme is the US policy of cultivating a stronger strategic relationship with India to counter the rise of China.⁷ This may tie the future of Pakistan and India's nuclear weapons to the emerging contest between the United States and China.

The original chapter upon which these updates are based was written by Zia Mian, director of the Project on Peace and Security in South Asia and co-director of the Program on Science and Global Security at Princeton University. Updates by Ray Acheson and Zia Mian.

Notes

1. Hans M. Kristensen and Robert S. Norris, "Pakistani nuclear forces, 2017," *Bulletin of Atomic Scientists*, Vol. 72, No. 6, pp.368–376.
2. International Panel on Fissile Materials, <http://fissilematerials.org/countries/pakistan.html>.
3. "Pakistan successfully tests multiple warhead missile," *Dawn*, 25 January 2017, <https://www.dawn.com/news/1310630>
4. "Pakistan attains 'second strike capability' with test-fire of submarine-launched cruise missile," *Dawn*, 11 January 2017, <https://www.dawn.com/news/1307384>
5. Zia Mian, "Pakistan", *Assuring Destruction Forever: 2015 edition*, Reaching Critical Will of the Women's International League for Peace and Freedom, April 2015, <http://www.reachingcriticalwill.org/images/documents/Publications/modernization/pakistan-2015.pdf>.
6. Zia Mian and A.H. Nayyar, "Playing the Nuclear Game: Pakistan and the Fissile Material Cutoff Treaty," *Arms Control Today*, April 2010, pp.17-24.
7. Zia Mian and M.V. Ramana, "Asian War Machines," *Critical Asian Studies*, volume 46, number 2, 2014, pp. 345-360.

Russia

President Putin announced in 2012 that Russia will replace its Soviet-built arsenals with modern weapons.¹ Russia's modernisation plans indicate determination to maintain parity with the United States in terms of number of warheads and delivery systems. Its nuclear weapon programme and military exercises seem to be both motivated by and further drive increased military spending, nuclear modernisation, and military exercises by Western Europe and the United States.

Current status

According to the *FAS Nuclear Notebook*, as of early 2017 Russia is estimated to have a military stockpile of roughly 4,300 nuclear warheads assigned for use by long-range strategic launchers and shorter-range tactical nuclear forces. Of these, roughly 1,950 strategic warheads are deployed on ballistic missiles and at heavy bomber bases, while another 500 strategic warheads are in storage along with some 1,850 nonstrategic warheads. In addition to the military stockpile for operational forces, a large number of retired but still largely intact warheads await dismantlement, for a total inventory of around 7,000 warheads. Russia deploys about 316 ICBMs; a fleet of 11 operational SSBNs; and 60–70 nuclear-capable heavy bombers.²

FAS notes that these numbers are different than those reported under New Strategic Arms Reduction Treaty because it “has special counting rules and only includes certain categories.” They expect Russia to reach compliance with the Treaty's limits by February 2018.³

Development and “modernisation”

However, Russia is also continuing its nuclear modernisation programme apace. In terms of its ICBMs, the current focus is the SS-27 Mod 2 (RS-24 or Yars), which carries four multiple independently targetable reentry vehicles. The missile, deployed in silos and on road-mobile launchers, is expected to become the main ICBM in Russia's strategic force after 2020. A rail-based ICBM is also in early design development, with a first flight test planned for 2019.⁴

Russia is also developing a “heavy” silo-based ICBM known as Sarmat, though testing has been postponed, pushing back anticipated deployment until at least 2020. FAS estimates that Sarmat will be able to carry ten warheads.⁵

FAS reports media rumours that Russia's Delta IV SSBNs—which are the mainstay of Russia's nuclear submarine force—will be upgraded to carry a modified Layner SLBM, which may carry an enhanced payload including “penetration aids”. Other submarines will be replaced by a new class of Borei SSBNs currently under construction. These submarines will increase the capability of the Russian nuclear forces because they carry more warheads, which means increasing strategic importance for the Russian SSBN fleet.⁶ Russia's navy is also the predominant deployer of nonstrategic nuclear weapons. Its modernisation programme includes work on nuclear attack submarines and nuclear-capable cruise missiles.⁷ Russia's bomber and cruise missile fleet is also

being modernised. A new long-range nuclear cruise missile, the KH-102, is being fielded; and the Tu-160 and Tu-95MS bombers are being modernised and are also changing operational status. Russia has plans to resume production of the Tu-160 strategic bombers; a next-generation bomber, the PAK-DA, is also in development.⁸

Budget

Modernisation of Russia's nuclear arsenal is part of a broader rearmament programme that is expected to spend about 700 billion USD on various military systems in 2011–2020. About 10 percent of these funds will be spent on strategic force modernisation.⁹ Financial constraints could

affect the scale of these plans, though the rearmament effort appears to have strong support of the political leadership and public, so significant cuts to the modernisation programme are unlikely. This situation may change if political environment in Russia would allow an open discussion of government spending priorities and the role of nuclear weapons in the national security policy, but so far this discussion has been very limited. In 2015 Russia was supposed to approve a new long-term rearmament programme. This programme, initially estimated to cost about 56 trillion rubles, was scaled down to 30 billion rubles. Then, as it was increasingly clear the budget may not support a program of this size, its approval was postponed until 2018.¹⁰



ICAN action against investments in nuclear weapons, Melbourne, Australia, April 2012. © Tim Wright

Perspective

Russia's position on nuclear weapons is directly linked to a number of security concerns, such as US ballistic missile defence, US advantage in terms of conventional weapon systems, NATO expansion, and in the long run, China's position in the region.¹¹ Public opinion in Russia tends to support the nuclear status of the country—according to a poll conducted in 2006, 76 percent of all the respondents believed that Russia “needs nuclear weapons.”¹² More than half of the population consider nuclear weapons to be the main guarantee of the security of the country and about 30 percent of respondents believe that nuclear weapons play an important, although not a

decisive, role. To a large extent, the lack of critical assessment of the role of nuclear weapons is a result of the lack of an open and informed discussion of national security priorities and policies that would involve independent voices. While there are non-governmental research organisations that are involved in the discussion of defence policies, there are no independent public organisations that would have nuclear weapons related issues on the agenda.

The original chapter upon which these updates are based was written by Pavel Podvig, director and principal investigator for the Russian strategic nuclear forces project (russianforces.org). Updates by Ray Acheson and Pavel Podvig.

Notes

1. President Putin, Meeting on implementing state armament programme for nuclear deterrence, 26 July 2012, Sochi, <http://eng.news.kremlin.ru/news/4220>.
2. Hans M. Kristensen and Robert S. Norris, “Russian nuclear forces, 2017,” *Bulletin of Atomic Scientists*, Vol. 73, No. 2, pp. 115–126.
3. *Ibid.*, p. 115.
4. Hans M. Kristensen and Robert S. Norris, *op. cit.*, pp. 119–120; 6. Pavel Podvig, “Flight tests of Barguzin rail-mobile ICBM are said to begin in 2019,” Russian strategic nuclear forces, 19 January 2017.
5. Hans M. Kristensen and Robert S. Norris, *op. cit.*, p. 120.
6. *Ibid.*, p. 121.
7. *Ibid.*, p. 123.
8. *Ibid.*, p. 122.
9. Pavel Podvig, “Russia to spend \$70 billion on strategic forces by 2020,” Russian strategic nuclear forces, 11 February 2011.
10. Дмитрий Бутрин and Иван Сафронов, “Вооружения вступили в бой с возражениями,” *Газета “Коммерсантъ”*, 19 February 2015.
11. Kearns, I, “Beyond the United Kingdom: Trends in the Other Nuclear Armed States”, British American Security Information Council (BASIC), November 2011, p. 16.
12. Ildar Akhtamzyan, Opinion Poll “Attitudes in the Russian Federation towards WMD Proliferation and Terrorism,” PIR Center Report, Moscow: Human Rights Publishers, 2006, pp. 16–17.

United Kingdom

Concern about the safety and sustainability of the UK's nuclear arsenal has been heightened since early 2017, after it was revealed that one of its missiles malfunctioned during a test off the coast of Florida in June 2016.¹ This information appears to have been concealed ahead of the vote in UK parliament on whether or not to renew the UK's Trident missile system. Parliament did vote in favour of renewal in July 2017, with a majority of 355. Renewal was opposed by the Scottish National Party, the Liberal Democrats, and some Labour members of parliament.² Thousands of people gathered across the UK to protest the design to renew Trident.³ The UK's extensive modernisation programmes are an indication of the country's intention to retain nuclear weapons indefinitely, contrary to legal obligations.

Current status

The UK has 120 operationally available nuclear warheads. This is part of a larger stockpile of between 180 and 225 warheads. The Ministry of Defence has indicated that it will reduce the overall stockpile to 180 warheads by the mid-2020s.⁴ There are four Vanguard class submarines, three of which are normally armed. Each armed submarine carries eight Trident D5 missiles and a total of 40 nuclear warheads.

Development and “modernisation”

The decision of parliament to renew Trident means that the Vanguard-class submarines, which are currently slated to leave services by the early 2030s (which is at least 13 years beyond its

design life), will be replaced.⁵ The successor submarine, now known as “Dreadnought,” entered the design phase in 2011; the Ministry of Defence anticipates that the first submarine will enter into service in the early 2030s (postponed from 2024).⁶ The intention is for it to remain in service until the 2060s. The new vessels will each have 12 missile tubes. This leaves open the possibility that the number of missiles carried could be increased.⁷ The submarines will have a new PWR3 reactor, which is being developed with US support.

The Trident warhead contains a mixture of UK and US elements. The high explosive in the warhead is British.⁸ Three key components are supplied from the US.⁹ This warhead is being upgraded to a new Mk4A specification. The Mk4A version will be in service until the 2040s. The modernised warhead will have a new fuzing system, which will enhance its capability and make it more effective against hardened targets. In 2019 the UK is due to make a decision on the production of a new warhead, which would replace the Mk4A. The Atomic Weapons Establishment is conducting research into new components for a future warhead. The Ministry of Defence has indicated that a replacement warhead “is not required until at least the late 2030s, possibly later.”¹⁰

The United States is extending the life of the D5 Trident weapon system, updating all the Trident subsystems: launcher, navigation, fire control, guidance, missile, and re entry. The US will supply the UK with upgraded Trident D5LE missiles and

with modernised fire control and navigation systems.¹¹ The life extension programme for the D5 will only sustain the missile until the early 2040s; thus the UK government has acknowledged that “investment in a replacement ballistic missile would eventually be needed.”¹²

Most of the UK’s facilities for developing and building nuclear warheads are being rebuilt or refurbished. Future hydrodynamic research will be conducted at a new facility in France.

Budget

Replacing the Trident submarines is expected to cost £31 billion.¹³ Another £10 billion has been put aside to cover any extra costs or spending over the estimate.¹⁴ In addition, extending the life of the current Trident missiles into the early 2060s will cost around £250 million.¹⁵ Keeping the current Trident submarines in operation until 2028, four years longer than planned, is also expected to cost between £1.2 and £1.4 billion.¹⁶ The annual operating costs of Trident are expected to be about £2 billion.¹⁷

Perspective

While some information is in the public domain there are major gaps in the UK’s transparency. The Mk4A warhead modernisation programme has been largely concealed from the public and parliament. The upgrade of nuclear warhead facilities has been presented as if it was unrelated to the replacement of Trident.

There has been increased public debate about the UK’s nuclear weapon system in recent years, in particular over the cost of renewing Trident as social service spending is being cut.

The future of Trident was a key issue in the Scottish independence referendum campaign in 2014. Prior to the vote the Scottish Government said that an independent Scotland would demand that all nuclear weapons were removed within four years and it would introduce a constitutional ban on nuclear weapons. Removing Trident from Scotland would be likely to leave the UK without any nuclear weapons, because of the severe difficulties of relocating Trident.¹⁸ In 2012 a report by the Scottish Campaign for Nuclear Disarmament argued that it would be practically possible to remove all nuclear warheads from Scotland in two years and to dismantle them all within four years.¹⁹ Opposition to nuclear weapons in Scotland continues to have a significant impact on UK politics even though Scotland did not vote for independence in 2014. The Scottish resistance to nuclear weapons at Westminster has sharpened since the referendum, with all but one Scottish MP in opposition to Trident renewal but also to any deployment of nuclear weapons in Scotland.²⁰ The Brexit vote made a strong case for another independence referendum, and allowing the



*Bairns Not Bombs Demo, George Square,
13 April 2015 © Scrap Trident*

Scottish First Minister the opportunity to start talking in the international context. Work for the next referendum is underway and nuclear weapons are already on the agenda.

The original chapter upon which these updates are based was written by John Ainslie, who was

coordinator of the Scottish Campaign for Nuclear Disarmament until his untimely death in 2016.

Some of the updates included in this chapter are from one of his last research publications, *The Trident Shambles*. Updates by Ray Acheson, with thanks to Janet Fenton of Scottish CND for her contributions.

Notes

1. Ewen MacAskill, "Is Britain's nuclear arsenal fit for purpose?" *The Guardian*, 27 January 2017.
2. Rowena Mason and Anushka Asthana, "Commons votes for Trident renewal by majority of 355," *The Guardian*, 18 July 2016.
3. Mark Townsend, "Trident rally is Britain's biggest anti-nuclear march in a generation," *The Guardian*, 27 February 2016.
4. *National Security Strategy and Strategic Defence and Security Review 2015*, November 2015, p. 34.
5. John Ainslie, *The Trident shambles*, Scottish CND, March 2016, <http://www.banthebomb.org/images/stories/pdfs/shambles.pdf>.
6. Ibid.
7. Ibid.
8. The UK Trident warhead contains EDC37, a British explosive, rather than the American equivalent, PBX9501.
9. The UK has purchased three W76 components—the Arming, Fuzing and Firing System, Gas Transfer System and Neutron Generator—from the US. Hansard, 4 December 2009.
10. *National Security Strategy and Strategic Defence and Security Review 2015*, op. cit., p. 35.
11. Statement of Rear Admiral Terry Benedict, Director Strategic Systems Programs, Subcommittee on Strategic Forces of the Senate Armed Services Committee, 6 April 2011, <http://armed-services.senate.gov/statemnt/2011/04%20April/Benedict%2004-06-11.pdf>.
12. *The United Kingdom's Future Nuclear Deterrent: The Submarine Initial Gate Parliamentary Report*, May 2011.
13. *National Security Strategy and Strategic Defence and Security Review 2015*, op. cit., p. 37.
14. Claire Milne, "How much does Trident cost?" *Full Fact*, 14 July 2016, <https://fullfact.org/economy/trident-nuclear-cost>.
15. "Replacing the UK's 'Trident' Nuclear Deterrent," House of Commons Library, 11 July 2016, <http://researchbriefings.parliament.uk/ResearchBriefing/Summary/CBP-7353>.
16. House of Commons, 8 November 2010, <https://www.publications.parliament.uk/pa/cm201011/cmhansrd/cm101108/debtext/101108-0001.htm#10110810001093>.
17. "Replacing the UK's 'Trident' Nuclear Deterrent," op. cit.
18. John Ainslie, *No Place For Trident*, Scottish Independence and Nuclear Disarmament, Scottish CND, 2014, <http://www.swordofdamocles.org/pdf/noplacfortrident.pdf>.
19. *Disarming Trident*, Scottish CND, 2012, <http://www.swordofdamocles.org/pdf/disarmingtrident.pdf>.
20. "Trident renewal: only one Scottish MP votes in favour," *BBC*, 18 July 2016.

United States

In recent months, one of the most startling pieces of information revealed about US nuclear force modernisation has been that the “overall killing power” of existing US ballistic missile forces is being increased by a factor of three. Experts writing for the *Bulletin of Atomic Scientists* described this increase in capability as “astonishing,” explaining that the modernisation programme “has implemented revolutionary new technologies that will vastly increase the targeting capability” of the nuclear forces and “creates exactly what one would expect to see, if a nuclear-armed state were planning to have the capacity to fight and win a nuclear war by disarming enemies with a surprise first strike.”¹ These new capabilities are at least twenty years in the making.²

This is but one piece of the US nuclear weapon “modernisation” programme. This programme has consistently been described by government officials as safety and security upgrades. In reality, the programme is resulting in new types of nuclear weapons and delivery systems and is increasing the overall force of the arsenal. Every weapon system is gaining, or is planned to gain, new capabilities. It is costing taxpayers tens of billions of dollars and is estimated to cost about a \$1 trillion over the next thirty years.

Current status

In terms of the current stockpile, as of 1 March 2017 the United States deployed 1,411 strategic warheads on 673 strategic delivery vehicles on

820 deployed and non-deployed launchers. The US also has about 500 “tactical” B61 gravity bombs, about 150 of which are deployed in Belgium, Germany, Italy, Netherlands, and Turkey.³ In all, the United States possesses approximately 6,800 warheads and bombs including deployed strategic warheads, non-strategic warheads, operational warheads not deployed, and including approximately 2,750 intact but “retired” warheads.⁴ There are at least 16,000 nuclear weapon pits in storage, up from more than 14,000 in 2009.⁵

At the very end of its term in office, the Obama administration announced it made unilateral reductions of 553 warheads since September 2015. Despite this, the Obama administration has cut fewer warheads than any other administration since the Cold War. Experts estimate that the warheads were taken from the inactive reserve of non-deployed warheads.⁶ This essentially means that identifying tags have been changed on the bombs in their storage bunkers, or their assigned code in a spreadsheet has been changed. They can be changed back at a moment’s notice. These warheads are not scheduled to be dismantled until the late 2020s, and then only if new warheads have been deployed in the meantime and the planned new warhead factories are built and running. Warhead “retirement” does not mean warheads will not re-enter the stockpile later.⁷

According to Hans Kristensen of the Federation of American Scientists, the “cut” of warheads probably includes excess W76, B61, B83, and

W84 warheads. The W84 was retired once before but was brought back into the stockpile when it was a candidate for a new nuclear cruise missile in development. Thus there is no operational or strategic import to these cuts. These warheads will not be dismantled for many years at current rates⁸ and can be brought back into the stockpile at any time.

As far as delivery systems go, the United States maintains a full triad. The US Air Force currently operates a force of 400 silo-based Minuteman III intercontinental ballistic missiles (ICBMs), with another 50 silos “kept warm” for use as necessary.⁹ It also operates a fleet of 20 B-2 and 89 B-52H strategic bombers, most of which are

nuclear-capable.¹⁰ The US Navy operates a fleet of 14 Ohio-class ballistic missile submarines (SSBNs), of which eight operate in the Pacific and six in the Atlantic.¹¹

Development and “modernisation”

The US is in the midst of an expansive nuclear weapon modernisation programme.¹² These efforts include a new class of SSBNs, a new long-range bomber with nuclear capability, a stealthy new air-launched cruise missile, a next-generation land-based ICBM, and a new nuclear-capable tactical fighter aircraft. It will also include complete full-scale production of one nuclear warhead (the W76-1), initiation of production on two others (the



ICAN campaigners in Melbourne, Australia with a mock US nuclear bomb © ICAN

B61-12 and W80-4), modernized nuclear command and control facilities, and new or upgraded nuclear weapon production and simulation facilities.¹³ For example, the Air Force is working on a new nuclear cruise missile (Long-Range Standoff, LRSO), which is scheduled for deployment in 2027. In 2014, the W80-1 thermonuclear warhead was chosen to be used on the new missile; it will be modified and deployed as the W80-4. The cost of the programme is estimated to be \$10-20 billion.¹⁴ In addition, the United States is planning to significantly redesign warheads for ballistic missiles. They will mix warhead components from different types into new designs that do not currently exist.¹⁵

At the moment, there is continuity between the Obama and Trump administrations in relation to the nuclear weapon Life Extension Programs as set out in the 2010 Nuclear Posture Review. However, the Trump administration is reportedly fast-tracking its review of this policy, which will include an examination of whether nuclear disarmament is a “realistic objective”.¹⁶

Budget

The Congressional Budget Office (CBO) first 2017 cost study estimates that existing plans for US nuclear forces will cost \$400 billion over the next ten years—which is \$57 billion more than its estimate in 2015. This increase is “largely because modernization programs will be ramping up.”¹⁷ A CBO study of thirty-year costs has been requested by Congress and is reportedly underway. Current estimates put this figure at \$1 trillion.

The Trump regime’s FY2018 budget outline increases the “ask” for nuclear weapons by \$1.4

billion, but this is a recovery from the impact of 2017’s continuing spending resolution, not an increase in total planned spending over the 2017-2018 period.¹⁹ The National Nuclear Security Administration (NNSA) has reportedly completed a new annual stockpile stewardship and management plan, but it has not yet been reviewed by the new Department of Energy secretary. Budget requests details for 2018 are not expected until late May or early June.

Perspective

In the midst of the reexamination of the US government’s commitment to nuclear disarmament as a “realistic objective” and its ongoing investments in modernising all parts of the nuclear weapon complex, tensions between the United States and Russia have been growing. New START expires in 2021 unless it is extended. With tensions on the rise, experts are skeptical about its extension let alone new arms control agreements. While right now there is continuity in the modernisation programme between the Obama and Trump administrations, this may change. There are still enormous fiscal and managerial pressures on the modernisation programme, but the likelihood of those pressures resulting in modernization cutbacks has decreased, given these tensions and the overall direction of US foreign policy so far under the Trump regime.

The original chapter upon which these updates are based was written by Greg Mello, executive director of the Los Alamos Study Group. Updates by Ray Acheson and Greg Mello.

Notes

1. Hans M. Kristensen, Matthew McKinzie, Theodore A. Postol, "How US nuclear force modernization is undermining strategic stability: The burst-height compensating super-fuze," *Bulletin of Atomic Scientists*, 1 March 2017.
2. George Lewis and Ted Postol, "The Capabilities of Trident against Russian Silo-Based Missiles: Implications for START III and Beyond," Massachusetts Institute of Technology, 2 February 1998; Greg Mello, "That Old Designing Fever," *Bulletin of the Atomic Scientists*, Jan/Feb 2000, <http://www.lasg.org/ThatOldDesigningFever.pdf>.
3. Hans M. Kristensen and Robert S. Norris, "United States nuclear forces, 2017," *Bulletin of the Atomic Scientists*, Vol. 73, No. 1, pp. 54-55.
4. This is based on New START disclosures available as of 4 January 2017 and Vice President Biden's remarks on 11 January 2017, and account for rates of dismantlement since then.
5. In 2009 there were "more than 14,000" pits in storage at the Pantex plant. It was thought at the time that Pantex might exceed its storage limit of 20,000 pits by 2014. Jim McBride, "Pantex may hit storage limit in 2014," *Amarillo Globe-News*, 29 January 2009. On 12 January 2017, Vice President Biden announced that the Obama Administration had dismantled 2,226 warheads and bombs. Few pits leave the site, and there have been further dismantlements in 2017, all of which brings the total on site to more—possibly thousands more—than 16,000.
6. Hans Kristensen, "Obama Administration Announces Unilateral Nuclear Weapon Cuts," Federation of American Scientists, 11 June 2017, <https://fas.org/blogs/security/2017/01/obama-cuts>.
7. Government Accountability Office, "Actions Needed by NNSA to Clarify Dismantlement Performance Goal," GAO-14-449, Apr 30, 2014. See Greg Mello, "U.S. claims of nuclear weapons retirement, dismantlement 'may be misleading' – GAO," May 1, 2014.
8. As Hans Kristensen notes, "The administration has promised that all the warheads that were retired prior to 2009 will be dismantled by 2021 (in reality some warheads already dismantled were retired after 2009). But with the average rate of about 278 warheads dismantled per year during the Obama administration, it will take until 2026 to dismantle the current backlog of retired warheads." See Hans Kristensen, "Obama Administration Announces Unilateral Nuclear Weapon Cuts," Federation of American Scientists, 11 June 2017, <https://fas.org/blogs/security/2017/01/obama-cuts>.
9. Kristensen and Norris, op. cit., p. 50.
10. Ibid., p. 53.
11. Ibid., p. 51.
12. See the 2015 edition of *Assuring Destruction Forever* for more comprehensive details.
13. Kristensen and Norris, op. cit., p. 49.
14. Hans M. Kristensen, "W80-1 Warheads Selected For New Nuclear Cruise Missile," Federation of American Scientists, 10 October 2014, https://fas.org/blogs/security/2014/10/w80-1_lrso.
15. Kristensen and Norris, op. cit., pp. 49–50.
16. Steve Herman, "Trump Administration Reviewing What Role US Nuclear Weapons Should Play," *Voice of America*, 25 March 2017.
17. Projected Costs of U.S. Nuclear Forces, 2017 to 2026, Congressional Budget Office, 14 February 2017, <https://www.cbo.gov/publication/52401>.
18. Greg Mello, "New study of nuclear deterrent costs: current plans to cost \$1 trillion over 30 years, therefore impossible," Los Alamos Study Group, 8 January 2014, http://www.lasg.org/press/2017/press_release_16Mar2017.html.
19. Greg Mello, "Trump DOE Budget Outline Accelerates Warhead Spending," Los Alamos Study Group, 16 March 2017, http://www.lasg.org/press/2017/press_release_16Mar2017.html.



Reaching Critical Will

Reaching Critical Will is the disarmament programme of the Women's International League for Peace and Freedom, the oldest women's peace organisation in the world. Reaching Critical Will works for disarmament and for an end to war and violence. It also investigates and exposes patriarchal and gendered aspects of weapons and war.

www.reachingcriticalwill.org
www.wilpf.org