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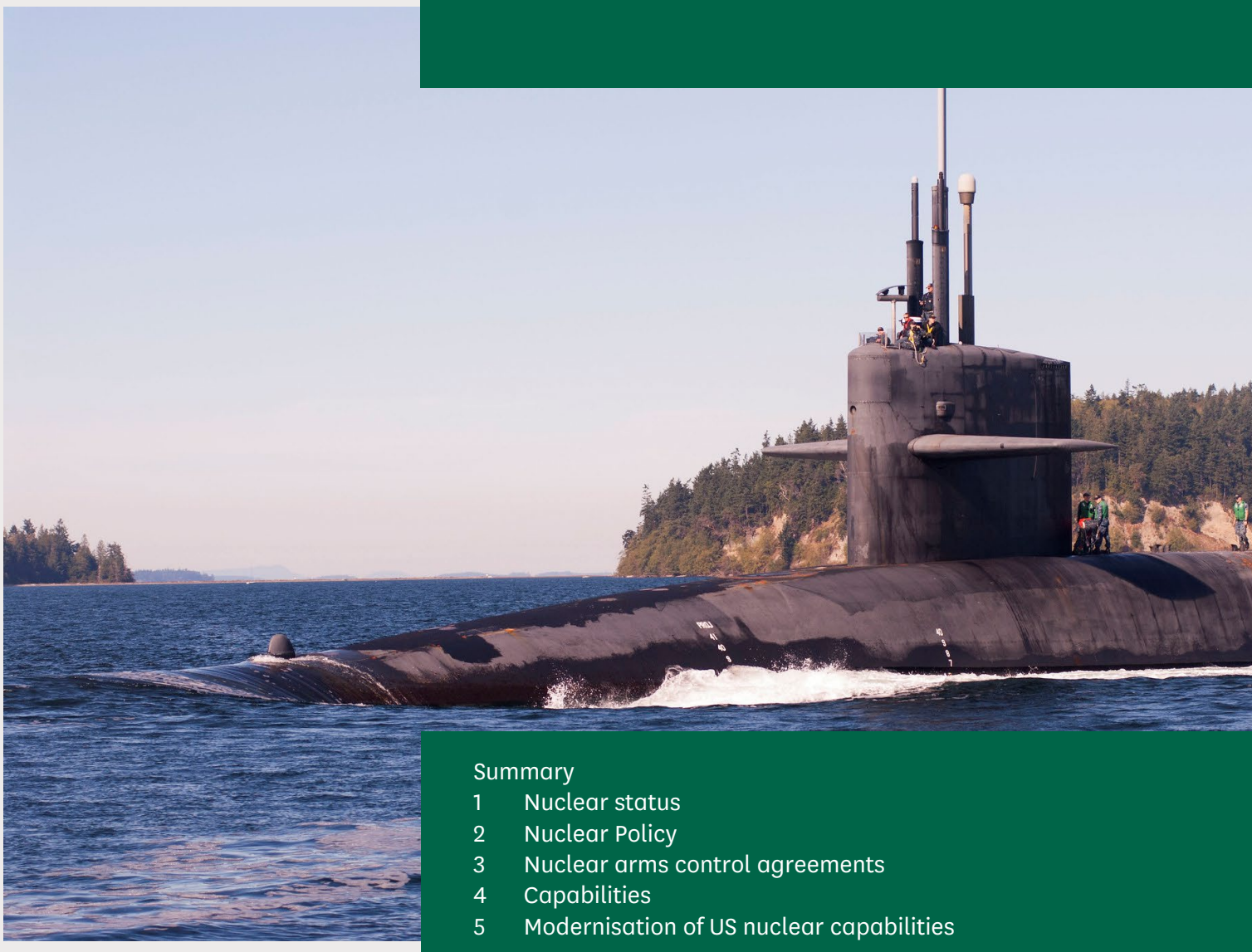
Nuclear weapons at a glance: United States



Summary

1 Nuclear status
2 Nuclear Policy
3 Nuclear arms control agreements
4 Capabilities
5 Modernisation of US nuclear capabilities

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Contents

Summary **4**

1 Nuclear status **5**

2 Nuclear Policy **6**

2.1 The 2022 Nuclear Posture Review 7

3 Nuclear arms control agreements **9**

3.1 Bilateral arms control 9

Resumption of the Strategic Stability Dialogue 10

3.2 Other nuclear-related agreements 10

4 Capabilities **14**

4.1 Stockpile 14

4.2 Fissile material 15

4.3 US Navy 15

4.4 US Air Force – Global Strike Command 16

US nuclear forces in NATO countries 16

5 Modernisation of US nuclear capabilities **18**

5.1 The Biden administration's 2023 budget request 19

5.2 Modernisation priorities 19

Summary

The 2022 Nuclear Posture Review (NPR) sets out the current nuclear policies of the US Administration. An unclassified version of the NPR is still awaited but it is thought to place greater reliance on disarmament and US leadership on arms control than the previous NPR led by the Trump administration.

Despite considerable progress in bilateral arms control since the 1970s, the United States still deploys an extensive nuclear force and is in the process of modernising and replacing its nuclear capabilities.

- As of January 2022, the total US nuclear stockpile was estimated at 5,428 warheads. Of those 3,708 are operational (strategic and non-strategic). A further 1,720 warheads are awaiting dismantlement.
- Under the US-Russian New START treaty, the number of deployed strategic warheads must not exceed 1,550. New START was extended in February 2021 for a further five years.
- Non-strategic warheads are not currently subject to any arms control limitations.
- US forces are organised on the nuclear triad principle.
- A portion of nuclear forces are maintained on day-to-day alert and the US adopts the practice of open ocean targeting of its strategic nuclear forces.
- The US retains a first-use option.

The US is undertaking an extensive modernisation programme across every element of the nuclear triad. The US nuclear programme is estimated to cost $634 billion over the next decade, of which $188 billion will be spent on weapons modernisation. In 2017, the Congressional Budget Office estimated that the US modernisation programme would cost at least $1.2 trillion over the next 30 years.

This short paper is intended as an introduction to the United States' nuclear weapons policies and programmes. It is part of a series of country profiles which are available on the House of Commons Library website.

1 Nuclear status

The United States conducted its first nuclear test in July 1945 and is the only country to have used nuclear weapons in conflict, when it dropped atomic bombs on the Japanese cities of Hiroshima and Nagasaki in August 1945.

Under the Nuclear Non-Proliferation Treaty (NPT) a nuclear weapon state is defined as one that manufactured and exploded a nuclear weapon, or other nuclear explosive device, prior to 1 January 1967.

Alongside the other permanent members of the UN Security Council (the P5), the US is, therefore, one of the five officially recognised nuclear weapon states under the NPT.

2 Nuclear Policy

Previous Nuclear Posture Reviews:

September 1994 – Bill Clinton

December 2001 – George W. Bush

April 2010 – Barack Obama

February 2018 – Donald Trump

US nuclear policy is set out in the Nuclear Posture Review, which is a comprehensive examination of US nuclear policy, strategy, capabilities and force posture. It is an opportunity for the US administration to set out its rationale for nuclear weapons, its position on use (declaratory and its overall aspirations with respect to nuclear policy, within the context of its overall national security strategy. Congressional support for the conclusions of an NPR is demonstrated through its allocation of resources for relevant programmes.

There is no official timeframe for when an NPR must take place, although NPR's have been conducted by each of the four previous US administrations at the start of their term in office. The first review in 1994 was an attempt to adapt US nuclear policy to the realities of the post-Cold War era. Subsequent reviews represented further opportunities to evolve US nuclear strategy in line with the shifting security landscape.

The last NPR in 2018, under the Trump administration, marked a significant departure from key nuclear policies under the Obama administration that had sought to lower the reliance on nuclear weapons and embrace non-proliferation and disarmament.[1] Deterrence, and not disarmament, was the overriding message of 2018 NPR, which called for flexible, non-strategic options in the US nuclear inventory. Programmes to lower the yield of some existing submarine-launched ballistic missile warheads and re-introduce nuclear capable, sea-launched cruise missiles (the SLCM-N programme)[2] were subsequently established. The NPR referred to them as "modest enhancements to current capabilities".[3] However, many argued that, while the introduction of lower-yield warheads and new cruise missiles may not be a quantitative increase in the size of the US nuclear arsenal, it represented a qualitative increase in capability and therefore undermined any overtures towards disarmament.

1 The conclusions of the 2010 Nuclear Posture Review are briefly summarised in House of Commons Library, President Trump: the nuclear question, , 22 October 2018

2 Prior to 2010 the US Navy deployed the nuclear Tomahawk land-attack cruise missile (TLAM/N) aboard some of its attack submarines. Its withdrawal from service was announced in the 2010 Nuclear Posture Review.

3 US Department of Defense, 2018 Nuclear Posture Review Factsheet, February 2018

2.1 The 2022 Nuclear Posture Review

The Biden administration initiated a new NPR in July 2021.

In the past President Biden has expressed the belief that nuclear weapons should play a smaller role in US defence strategy and that a nuclear-free world should be the ultimate goal. He opposed the decision in the 2018 NPR to introduce lower yield, non-strategic nuclear options into the nuclear arsenal and argued that current US nuclear spending is excessive. [4] In a piece for Foreign Affairs in March 2020 he said that "the sole purpose of the US nuclear arsenal should be deterring – and, if necessary, retaliating against – a nuclear attack".[5]

Initial expectations for the NPR were subsequently for a return to the nuclear policies of the Obama era and a possible shift in declaratory policy to one of "sole purpose" or no first use. However, as James Acton at the Carnegie Endowment for International Peace observed in September 2020:

> Biden's instincts on nuclear weapons are more liberal than those of much of the Democratic Party's defense establishment. But that doesn't necessarily mean he would fundamentally change US nuclear policy. In practice, there are often pressures to continue the status quo.[6]

The NPR was expected in early 2022. In March 2022 a classified version of the NPR was sent to the US Congress and the Department of Defense published a one-page summary of its guiding principles. However, an unclassified version of the report, setting out the detail, is yet to be published.

What the summary reveals is a continuation of many of the US' previous nuclear policies under the Obama administration. It states a commitment to "reducing the role of nuclear weapons" and re-establishing the US' leadership on arms control.

Although the summary provides no detail on specific capabilities, it has been widely reported that the new NPR will rubber stamp the decision to cancel the SLCM-N programme, which was established following the previous NPR. Funding for the programme has already been cut from the administration's 2023 budget request (see below). Disagreement over the cancellation of this programme is thought to be one of the reasons behind the delay in the NPR's publication. Potential changes to the NPR, as a result of the administration's forthcoming National Security Strategy, which in itself has been delayed due to the crisis in Ukraine, has been cited as another. [7]

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4 Council for a Livable World, accessed October 2020

5 President-elect Joe Biden, "Why America must lead again", Foreign Affairs, March/April 2020

6 Associated Press, "Biden would push for less US reliance on nukes for defense", 21 September 2020

7 Strategic Comments, "The US Nuclear Posture Review in limbo", June 2022

Declaratory Policy

The US has never adopted a "no first use" policy.

Despite expectations, however, the new NPR does not go so far as to espouse a "sole purpose" or no-first-use policy for the US. Instead, it maintains the policy set out in successive NPR, namely that the US would "only consider the use of nuclear weapons in extreme circumstances to defend the vital interests of the United States or its allies and partners".[8] The detail of what is considered an "extreme circumstance" is, however, unclear.[9]

A portion of the US' nuclear forces are maintained on day-to-day alert. The US also adopts the practice of open ocean targeting of its strategic nuclear forces.

In January 2022 the five recognised nuclear weapon states (the P5) also issued a statement in which they affirmed that "a nuclear war cannot be won and must never be fought" and that nuclear weapons "should serve defensive purposes, deter aggression, and prevent war".[10]

8 US Department of Defense, Fact Sheet: US Nuclear Posture Review and Missile Defense Review, March 2022

9 The 2018 NPR had expanded the definition of "extreme circumstance" to include significant non-nuclear strategic attacks, including cyber, on critical national infrastructure and civilian populations and attacks on US or allied nuclear forces, including command and control and warning and attack assessment capabilities.

10 Joint Statement of the Leaders of the Five Nuclear Weapon States, 3 January 2022

3 Nuclear arms control agreements

3.1 Bilateral arms control

After the Cuban Missile Crisis, and throughout the 1960s, there was mounting concern about the rapid expansion in the number of nuclear warheads and delivery systems. In response, bilateral talks aimed at restricting the nuclear arsenals of the Soviet Union and the US began. Over the decades that followed, a series of arms control regimes emerged.

A history of these bilateral arms control agreements is available in:

Nuclear weapons: disarmament and non-proliferation regimes, House of Commons Library, June 2016

Of those agreements only the New START treaty, concluded in 2010 and extended in 2021,[11] remains in force. The US officially withdrew from the Intermediate-Range Nuclear Forces (INF) treaty on 2 August 2019.

Box 1: Provisions of New START

Under the terms of New START the US and Russia committed to:

1. A limit of 1,550 strategic operationally deployable warheads
2. A combined limit of 800 deployed and non-deployed intercontinental ballistic missile (ICBM) launchers, submarine launched ballistic missile (SLBM) launchers and heavy bombers equipped for nuclear armaments.

The treaty also established a verification regime that combines various elements of the original START verification regime and measures that are tailored to the current treaty.

Following a five-year extension, the New START agreement will now remain in force until February 2026.

[11] Within the first few weeks of entering office President Biden agreed, along with Russian President Vladimir Putin, to extend the New START agreement by a further five years.

Resumption of the Strategic Stability Dialogue

In June 2021 talks on future arms control, and a potential successor to New START, were re-established by the US and Russia through the Strategic Stability Dialogue (SSD) forum. That forum has met twice since, in September 2021 and then again in January 2022 in an extraordinary meeting convened amidst the emerging crisis in Ukraine.

Following Russia's invasion of Ukraine in February 2022, however, the US suspended further dialogue within the SSD, and it is unclear when, or if, it will resume.[12] At the end of June 2022 President Putin indicated Russia was "open to dialogue on ensuing strategic stability", while President Biden is reported to have expressed support for continued engagement with the Kremlin.[13] However, amid the current situation in Ukraine both sides have acknowledged there are no immediate plans for a resumption of talks.[14]

3.2 Other nuclear-related agreements

American nuclear assets contribute to the NATO nuclear umbrella and US tactical nuclear weapons are based in a number of European countries (see below).[15]

In Asia and the Middle East, the US has maintained extended deterrence through a series of bilateral arrangements, a forward military presence and security guarantees.[16]

12 US State Department, Department Press Briefing, 25 February 2022

13 Arms Control Today, "Russian-US dialogue remains uncertain", June/July 2022

14 Arms Control Today, "Russian-US dialogue remains uncertain", June/July 2022

15 Belgium, Germany, Italy, Netherlands and Turkey. Some commentators consider those states to be nuclear states by virtue of the fact that US nuclear weapons are based on their soil. Nuclear weapons were withdrawn from the UK in 2008.

16 The concept of extended deterrence is an important one, particularly for countries such as Japan which has chosen to forego the option of developing its own nuclear capability in return for the protection provided by the US nuclear umbrella. A number of analysts have suggested that abandoning extended deterrence could encourage proliferation as several states could seek to develop their own nuclear weapons capability as an alternative.

Article VI, NPT

Each of the Parties to the Treaty undertakes 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, and on a treaty on general and complete disarmament under strict and effective international control.

Nuclear Non-Proliferation Treaty

As a State Party to the NPT, the US has a legal obligation to pursue disarmament under Article VI of that treaty.

Comprehensive Test Ban Treaty

The US signed the Comprehensive Test Ban Treaty in 1996, but Congress is yet to ratify it.[17] The Senate rejected ratification in 1999 and despite a commitment in the 2010 NPR to seek ratification of the treaty, the US administration failed to bring the matter before Congress before President Obama left office in January 2017.

While the 2018 NPR confirmed the US' intention to maintain its moratorium on nuclear testing, ratification of the Comprehensive Test Ban Treaty was no longer a policy objective under the Trump administration. Instead, the 2018 NPR took an open-ended approach, stating:

> The United States will not resume nuclear explosive testing unless necessary to ensure the safety and effectiveness of the U.S. nuclear arsenal and calls on all states possessing nuclear weapons to declare or maintain a moratorium on nuclear testing.[18]

Suggestions in May 2020 that the Trump administration had discussed the possibility of resuming explosive nuclear testing was met with widespread criticism from US lawmakers and the international disarmament community alike.[19]

In contrast, however, President Biden has long expressed support for the CTBT and considers the US to have already gained "adequate data from decades of tests".[20] In May 2022 the US Under Secretary for Arms Control and International Security, Bonnie Jenkins, reiterated the US' commitment toward the CTBT and its entry into force, while maintaining a moratorium on testing. She did not, however, go so far as to state that the Biden administration would seek Senate ratification.[21]

17 The CTBT will only enter into force 180 days after ratification by the five nuclear-weapon states and a further 39 non-nuclear weapon states that were identified at the time the treaty was negotiated as possessing either civilian nuclear power reactors and/or nuclear research reactors. Collectively these 44 states are referred to as Annex 2 states. Eight annex 2 states have yet to ratify the treaty: the US, China, Israel, India, Pakistan, North Korea, Egypt and Iran.

18 US Nuclear Posture Review, 2018, p.72

19 Federation of American Scientists, Letter to the Senate Majority Leader, June 2020

20 Council for a Livable World, updated October 2020

21 US Department of State, Priorities regarding the new and emerging challenges to international security, 26 May 2022

Fissile Material Cut-Off Treaty

In May 2022 the US administration expressed continued US support for the commencement of negotiations on a fissile material cut-off treaty,[22] and called on "all relevant countries to join us in declaring and maintaining a moratorium on such production".[23]

Open Skies Treaty

In May 2020 the US announced its intention to withdraw from the Open Skies Treaty.[24] Although not concerned with direct limitations on nuclear stockpiles, delivery systems or materials, the treaty established confidence building measures in relation to each State Parties military capabilities, including nuclear assets.

The US justified its decision on the grounds that Russia had been violating the agreement and stated that it may reverse its decision if Russia returned to compliance.

However, the Trump administration confirmed the US' withdrawal from the treaty on 22 November 2020. National Security Adviser, Robert O'Brien said the decision to withdraw was part of an effort to "put America first by withdrawing us from outdated treaties and agreements that have benefitted our adversaries at the expense of our national security".[25]

The withdrawal was viewed as another blow to the international arms control architecture.

Treaty on the Prohibition of Nuclear Weapons

The United States has not signed the Treaty on the Prohibition of Nuclear Weapons which was adopted in 2017. The Treaty received its 50th State ratification on 24 October 2020 and entered into force in January 2021.

In May 2022 the US Under Secretary for Arms Control and International Security said that while US concerns about the ability of the TPNW to achieve its goals had not changed, the US remained "committed to engaging in

22 An FMCT is a proposed international agreement that would prohibit the production of the two main components of nuclear weapons: highly enriched uranium (HEU) and plutonium. Efforts to begin negotiations have been ongoing since the early 1990s.

23 US Department of State, Priorities regarding the new and emerging challenges to international security, 26 May 2022

24 Signed in 1992 and entered into force in 2002, the treaty permits each State Party to conduct short notice, unarmed, observation flights over the territories of other State Parties in order to collect data on military forces and activities. All imagery collected is then shared with the other State Parties.

25 National Security Council Twitter account, 22 November 2020

pragmatic efforts to pursue effective measures related to nuclear disarmament".[26]

[26] US Department of State, Priorities regarding the new and emerging challenges to international security, 26 May 2022

4 Capabilities

Nuclear deterrence is one of the five missions under the responsibility of US Strategic Command. Like Russia, China, and more recently India, the US operates a nuclear triad of sea, land and air-based systems.

4.1 Stockpile

As of January 2022, SIPRI estimated the total US nuclear stockpile at 5,428 warheads, of which:

- 3,708 are active/operational warheads (strategic and non-strategic/ tactical)
- 1,720 are retired and awaiting dismantlement.[27]

The most recent data exchanged between the US and Russia under the terms of the New START agreement showed that of those 3,708 operational US warheads 1,515 were deployed strategic nuclear warheads (below the ceiling agreed).[28] The US also has 200 non-strategic warheads in its inventory. Approximately 100 of those warheads are thought to be deployed in Europe, of which 60 are earmarked for use by NATO aircraft.[29]

In 2019 the Trump administration stopped publicly disclosing the size of the US nuclear stockpile. That policy decision has since been reversed by the Biden administration which stated in October 2021 that "increasing the transparency of states' nuclear stockpiles is important to nonproliferation and disarmament efforts".[30]

In their Nuclear Notebook, Hans Kristensen and Matt Korda estimate that the US nuclear stockpile will continue to decrease over the next 10-15 years as modernisation programmes (see below) consolidate the remaining warheads.

27 SIPRI, Yearbook 2022: Summary (PDF), June 2022

28 US Department of State, New START treaty aggregate numbers of strategic offensive arms, 1 March 2022

29 Kristensen and Korda, United States nuclear weapons, 2022

30 US Department of State, Transparency in the US nuclear weapons stockpile, October 2021

4.2 Fissile material

The US no longer produces fissile material for weapons purposes, although it does retain a stockpile.[31] The latest figures from the International Panel on Fissile Materials suggests that the US has 495 tonnes[32] of highly enriched uranium (HEU), of which 361 tonnes is available for weapons purposes, and 87.8 tonnes of plutonium, of which 38.4 tonnes is available for weapons purposes.[33]

4.3 US Navy

The Navy has 14 Ohio class ballistic missile submarines (SSBN) equipped with up to 20 Trident II D5 SLBM.[34] Two of those SSBN are in refit at any one time, while the remaining 12 are available for deployment. The US has operated a posture of continuous at-sea deterrence since 1960.

In total, those 12 operational SSBN are capable of deploying 240 trident missiles. Each one of those missiles can be configured with up to 12 warheads, although in practice each missile is thought to deploy with 4 or 5 warheads apiece.

In late 2019 the Navy started to deploy a new low-yield warhead (the W76-2) on some of its SSBN, as promised in the 2018 NPR.

A service-life extension programme for the Trident II D5 missile will keep the missile in service until at least 2042. A programme to replace the Ohio class SSBN is currently underway (see below).

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31 The US halted the production of HEU for weapons in 1964 and ceased plutonium processing for weapons in 1992.

32 Also referred to as Metric Tons (MT)

33 The amount of HEU needed to make a nuclear weapon varies with the degree of enrichment and the sophistication of the weapon design. In general, the higher the enrichment level and greater sophistication, the less HEU is needed to make a bomb. Plutonium-based nuclear weapons only work as implosion weapons, with more sophisticated weapons using less plutonium. The International Panel on Fissile materials estimates a second generation boosted warhead would require 12kg of HEU or 4-5kg of plutonium (*Global Fissile Materials Report 2015*)

34 The Ohio class is capable of deploying with 24 missiles. Under the terms of New START the actual number of deployed missiles was reduced to 20 in 2016.

4.4 US Air Force – Global Strike Command

Ground-launched

The US Air Force fields an estimated 400 Minuteman III ground-launched ICBM, which has a range of approximately 13,000km.

Under the 2010 NPR the Obama administration announced plans to de-MIRV[35] existing missiles, with each missile now carrying a single warhead.[36] That process was completed in June 2014. Under New START 50 ICBM have been removed from their silos, although they are expected to be kept in reserve.[37]

A series of service-life extension programmes for the Minuteman III will retain the ICBM in service until 2030.

Air-launched capability

The Air Force also operates a fleet of 66 bombers, which are dual-capable and therefore able to deploy with both nuclear and conventional munitions.[38] Of those, 20 are B2-A Spirit bombers and 46 are B-52H Stratofortress bombers. The B2-A carries up to 16 nuclear-armed gravity bombs, while the B-52H is capable of carrying 20 air-launched cruise missiles.

In addition, the US also deploys several fighter aircraft in a dual-use tactical/non-strategic role. The F-15 and F-16, carrying the B-61 gravity bomb have been the cornerstone of this force. In the future this capability will be replaced by the Joint Strike Fighter and an upgraded gravity bomb: the B61-12 (see below).

US nuclear forces in NATO countries

As outlined above, the US has tactical nuclear forces deployed at six bases in five NATO countries: Belgium, Germany, Italy, Netherlands and Turkey.[39] All of those countries are parties to the NPT and have signed and ratified the CTBT. US nuclear weapons were removed from Greece in 2001 and from the UK in 2008. In 2019 the US was reported to be reviewing the basing of its nuclear weapons in Turkey, given recent tensions with the country.[40] Several media reports speculated that the US could relocate its nuclear assets to the US

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35 MIRV – multiple independently targetable re-entry vehicle, meaning a missile is capable of carrying multiple warheads.

36 The missiles will remain MIRV-capable and warheads are expected to remain in storage should it become necessary.

37 Bulletin of the Atomic Scientists, US nuclear forces 2015, 2015

38 No more than 60 bombers are deployed at any one time.

39 Aviano and Ghedi in Italy, Büchel in Germany, Incirlik in Turkey, Kleine Brogel in Belgium and Volkel in the Netherlands.

40 See Arms Control Today, "Concern grows about US weapons in Turkey", November 2019 and Federation of American Scientists Blog, "Urgent: move US nuclear weapons out of Turkey", 16 October 2019

naval facility at Souda Bay in Crete, although no such moves have since been made.

Those nuclear forces currently comprise an estimated 100 B-61 gravity bombs[41] capable of being deployed on US F-15 and F-16 aircraft, Belgian, Dutch and Turkish F-16 aircraft and German and Italian Tornados. The US maintains "absolute control and custody of the associated nuclear weapons".[42] It has been noted that under a programme, referred to as Snowcat (support of nuclear operations with conventional air tactics), all NATO countries participate in NATO's nuclear mission even if they do not have nuclear weapons stationed on their territory or have aircraft tasked with a nuclear role.[43]

At the NATO Heads of State and Government Summit in Warsaw in July 2016 NATO leaders reaffirmed NATO's nuclear status, and on the subject of tactical nuclear weapons in Europe, stated:

> NATO's nuclear deterrence posture also relies, in part, on United States' nuclear weapons forward-deployed in Europe and on capabilities and infrastructure provided by Allies concerned. These Allies will ensure that all components of NATO's nuclear deterrent remain safe, secure, and effective. That requires sustained leadership focus and institutional excellence for the nuclear deterrence mission and planning guidance aligned with 21st century requirements. The Alliance will ensure the broadest possible participation of Allies concerned in their agreed nuclear burden-sharing arrangements. [44]

41 At the height of the Cold War the US had 7,300 tactical nuclear weapons deployed in Europe. Since the 1970s that number has been steadily shrinking. In 1986 the US withdrew nearly 2,000 weapons, followed by 3,000 between 1991 and 1993. By 2001 the US is estimated to have had 480 tactical nuclear weapons in Europe, which was subsequently halved to 200 by 2007 (See Bulletin of the Atomic Scientists, Tactical nuclear weapons, 2019)

42 NATO website: NATO's nuclear deterrence policy and forces

43 Bulletin of the Atomic Scientists, Tactical nuclear weapons, 2019

44 NATO Warsaw Summit Communiqué, 9 July 2016, para.53

5 Modernisation of US nuclear capabilities

In 2017 the Congressional Budget Office estimated that, over the next 30 years, the US nuclear modernisation programme would cost at least $1.2 trillion, not accounting for inflation or other cost growth.

The last time the United States undertook a major modernisation of its nuclear arsenal was in the 1980s. Most of those systems are now nearing the end of their service lives, having been subject to numerous service-life extension programmes.

Consequently, the Obama administration began an extensive nuclear modernisation programme across all three elements of the nuclear triad. In 2014 it was estimated that the cost of maintaining, modernising and replacing the triad, over the next 30 years, could be in the region of $600 billion to $1 trillion.[45] Such expenditure was likened to "spending for procurement of new strategic systems in the 1980s under President Ronald Reagan".[46]

That programme of modernisation was continued, and expanded, under President Trump, most notably to include the procurement of a nuclear tipped sea-launched cruise missile.

An estimate published by the Congressional Budget Office in 2021 suggested that the total US nuclear programme is expected to cost $634 billion up to 2030.[47] Approximately $188 billion will be spent on weapons modernisation programmes.[48]

Between 2021 and 2030 projected spending on the nuclear arsenal is estimated to consume, on average, 7% of total national defence spending, while modernisation programmes are expected to total more than 9% of the Department of Defense's procurement budget.[49]

45 National Defense Panel Review of the 2014 Quadrennial Defense Review, Ensuring a strong US defense for the future, July 2014

46 Center for Nonproliferation Studies, The Trillion Dollar Nuclear Triad, January 2014

47 The CBO is required by law, every two years, to project the costs of US nuclear forces over the coming decade. Its 2021 estimate includes $83 billion for unaccounted cost growth. Budgeted programmes currently total $551 billion over this period.

48 Congressional Budget Office, Projected costs of US nuclear forces, 2021-2030 (PDF), May 2021, p.4

49 Congressional Budget Office, Projected costs of US nuclear forces, 2021-2030 (PDF), May 2021, p.4

In 2017 the CBO forecast that over the next 30 years, the whole modernisation programme would cost at least $1.2 trillion, not accounting for inflation and other increased costs.[50]

5.1 The Biden administration's 2023 budget request

In March 2022, the Department of Defense released its budget request for 2023. In the absence of a detailed NPR, the Biden administration's budget request for 2023 provides a useful indication of its thinking on nuclear modernisation.

In line with previous administrations, the budget identifies the modernisation of US nuclear forces across all three legs of the nuclear triad as the Pentagon's "number one priority". It allocates a total of $34.4 billion for 2023, including for a new class of SSBN, a new long-range bomber, a new Ground Based Strategic Deterrent (GBSD) and a long-range stand-off missile.[51]

The budget request does not, however, include funding for the nuclear-tipped sea-launched cruise missile (SLCM-N) that was established under the Trump administration. The decision to cancel the programme has been met with opposition from some members of Congress and is thought to be one of the reasons behind the delay in publishing an unclassified version of the NPR.[52]

5.2 Modernisation priorities

On the basis of the existing modernisation plan, and the Biden administration's budget request for 2023, the Pentagon's modernisation priorities are thus:

- **A new class of SSBN (the Columbia class submarine)** which will replace the current Ohio class from October 2030 onwards. Twelve new SSBN are planned and will be equipped with 16 missiles tubes, as opposed to the current 24 (although only 20 are operational). Construction of the first vessel started in September 2020. $6.3 billion has been requested for FY2023, but the current estimated cost of the total programme is $111.9 billion (including research and development), or an average of $9.35

[50] Upper end estimates have placed the total cost of the modernisation programme at $1.7 trillion once inflation is taken into account (see: Arms Control Today, "CBO: nuclear arsenal to cost $1.2 trillion", December 2017)

[51] Office of the Under Secretary of Defense/Chief Financial Officer, United States Department of Defense Fiscal Year 2023 Budget Request (PDF), April 2022, p.13

[52] Editorial Board of the Wall Street Journal, "Many in Congress want to restore the SLCM-N in the military budget, and we hope they succeed", 20 April 2022

billion per submarine).[53] It will be the Pentagon's third largest procurement programme and is expected to consume around 40% of the US Navy's shipbuilding budget. On 9 December 2020, the Pentagon published its 30-year shipbuilding plan in which fully funding the Columbia class programme was identified as the main priority. The Columbia class will initially be deployed with the upgraded Trident II D5 missile. That missile was expected to be replaced by a new SLBM. In 2021 however, the US Navy confirmed that a second service-life extension programme (D5LE2) of the Trident II D5 would be undertaken to maintain the missile in service until 2084 and the end of the service life of the Colombia class SSBN.[54]

- A new **long-range strategic bomber (B-21 Raider)** for deployment in the mid-2020s. Current expectations are for a fleet of at least 100 aircraft, although the final total may be higher. The 2023 budget request for the programme is $5 billion. On the basis of initial US Air Force estimates (uprated to current prices), the total cost of the programme is estimated at $73 billion. Independent estimates have, however, said the cost could be at least $110 billion.[55]

- The new bomber will be equipped with the new **B61-12 guided stand-off nuclear gravity bomb**. The B61-12 entered full scale production in May 2022 and is expected to be completed in 2026,[56] at a cost of $8-9 billion.

  The B61-12 will also be deployed in Europe in the mid-2020s. Initially it will be retrofitted to existing F-15, F-16 and Tornado aircraft but will eventually arm US F-35 aircraft once they are deployed.[57]

- A new **long-range standoff (LRSO) cruise missile** will also be deployed on both the new B-21 Raider and the Air Force's existing B2-A and B-52H strategic bombers. The Air Force plans to procure approximately 1,000 LRSO missiles, of which half will be nuclear armed, for deployment in 2030. Total acquisition cost, including research and development, is currently estimated at $14 billion.[58]

- A **next-generation ICBM (the Ground Based Strategic Deterrent programme)** which will replace the Minuteman III, and associated command and control infrastructure from 2028. The GBSD has been designated the LGM-35A Sentinel and will be capable of carrying single or multiple warheads. It is expected to achieve full operational capability in 2036. The new missile is expected to have greater range that the

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53 US Government Accountability Office, Weapon systems annual assessment (PDF), June 2022, p.179

54 US Government Accountability Office, Weapon systems annual assessment (PDF), June 2022, p.179 and Kristensen and Korda, US Nuclear Forces, 2022

55 "Trump continues Obama nuclear funding", *Arms Control Today,* August 2017

56 Sandia National Laboratories, Press release, 11 February 2022

57 The Netherlands, Italy and Belgium are buying the F-35 from the US. The US has halted delivery of the F-35 to Turkey because of its plans to procure the S-400 air defence system from Russia. Germany has rejected the F-35 in favour of purchasing either an upgraded Typhoon or The F-18.

58 US Government Accountability Office, Weapon systems annual assessment (PDF), June 2022, p.87

current Minuteman, making it theoretically possible to target, not only Russia, but also China, North Korea and Iran from the continental US. Under current plans replacement of the Minuteman III and rebuilding the existing infrastructure is expected to cost in the region of $95 - $140 billion over the next 30 years.[59] It will provide the US with a nuclear ICBM capability well into the 2070s. There has been controversy over the Pentagon's handling of the programme after Boeing dropped out in July 2019 citing unfair competition. That decision left Northrop Grumman as the sole bidder. In September 2020 the US Air Force awarded an initial $13.3 billion manufacturing contract to the company.

In support of these plans, a number of nuclear warhead programmes are also underway by the National Nuclear Security Administration (NNSA). In its 2023 budget request the NNSA has identified $21.4 billion of required funding, including:[60]

- $162 million for the W88 Alteration 370 programme for the Trident II D5 missile.
- $672 million for the B61-12 LEP (see above)
- $1.1 billion for the W80-4 LEP, which will provide a warhead for the long-range stand-off cruise missile (LRSO) programme.
- $680 million for the W87-1 warhead, which will arm the Sentinel ground based strategic deterrent. The total projected cost of that programme is $14.8 billion.[61]
- $241 million for the new W-93 warhead and $97.1 million for its Mk7 re-entry vehicle, which would be deployed on the Trident II D5 from the mid-2030s. The W-93 will eventually replace the W-76 and the W-88.

  At an estimated $14 billion in total, the W-93 will be the Navy's third submarine-launched warhead programme. As such it has been labelled by many analysts as unnecessary.[62] Crucially, however, work on the W-93 programme will support the UK's own replacement warhead programme.[63]

59 Federation of American Scientists, Ground Based Strategic Deterrent: High risk, no reward (PDF), February 2021. The initial cost estimate published by the US Air Force in 2015 was $62.3 billion.

60 Department of Energy, FY2023 Budget Request Vol.1 Weapons Activities (PDF)

61 US Government Accountability Office, Nuclear weapons (PDF), September 2020

62 Congressional Quarterly Roll Call, "Trump team's case for new nuke cites risks in current arsenal", 29 July 2020

63 For further detail on the UK programme see House of Commons Library, Replacing the UK's nuclear deterrent: the long awaited warhead decision

Box 2: Suggested reading

- Senate Armed Services Committee, USSTRATCOM and USSPACECOM Testimony, 9 March 2022
- US Congressional Research Service, Nonstrategic nuclear weapons (PDF), 7 March 2022
- Kristensen and Korda, Nuclear Notebook: United States nuclear forces (PDF), 2022
- SIPRI Yearbook 2022, World Nuclear Forces: Summary (PDF)
- US Congressional Research Service, US strategic nuclear forces: background, developments and issues (PDF), December 2021
- US Department of Defense, Joint Publication 3-72, Nuclear Operations (PDF), June 2019

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