The Fourth Nuclear Age

The Perilous Geopolitics of a Spiralling Arms Race

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The world is currently undergoing the Fourth Nuclear Age, a second phase of the nuclear arms race, driven by simultaneous shifts in geopolitics and technology. It is remarkably different from previous eras due to multipolarity, the increased likelihood of risky conventional wars among nuclear-armed states, and the reconceptualisation of nuclear strategy, which aims to fight a nuclear war rather than merely maintain deterrence stability.

The fourth nuclear age is defined by two conflicts between India and Pakistan in February 2019 and May 2025, the absence of an operative bilateral arms control treaty between Russia and the United States from February 21, 2023—signaling reduced arms control cooperation—increasing confidence in missile defense systems, and an echo of the resumption of nuclear weapons tests or the end of voluntary national moratoria on nuclear tests.[1] These developments create not only a space for conventional war between the nuclear-armed rivals but also obligate us to think about the unthinkable nuclear armageddon. "Regional military competition between India and Pakistan, North Korea and South Korea, China and India, and among China, North Korea, Japan, and the United States, threaten to escalate conventional war into nuclear first use, and even short of crossing the nuclear threshold, exacerbate regional and global nuclear tensions."[2] The "sword of Damocles" that hung over in the first nuclear age has again hovered over.

The trends in contemporary geopolitics and technology are conducive to nuclear proliferation. "Nuclear proliferation is the process by which state or nonstate actors without nuclear weapons acquire the technologies and materials needed to build and deliver them."[3] In the fourth nuclear age, great-power cooperation is absent. Therefore, no nuclear arms control talks between China, Russia, and the U.S. are on the horizon, and each may use one another's actions as a pretext to acquire more nuclear weapons. China's rapid nuclear arsenal expansion will be a pretext for New Delhi, Moscow, and Washington to acquire more weapons.[4] India's nuclear buildup discourages Pakistan's nuclear restraint policy entailing to the modernisation of its nuclear arsenal. France, the United Kingdom,

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[1] Russia stopped implementing New START in February 2023 because it objected to the continuing U.S. assistance to Ukraine. The latter stopped implementing the treaty on a reciprocal basis. Rose Gottemoeller, "Getting the Most Out of New START Before It Expires," Arms Control Today, December 2025.

[2] Lawrence J. Korb, and Stephen Cimbala, "Why Nuclear Arms Control Isn't Obsolete," The National Interest, January 13, 2026.

[3] "Preventing an Era of Nuclear Anarchy: Nuclear Proliferation and American," Security Report of the Task Force on Nuclear Proliferation and U.S. National Security, Washington D.C. Carnegie Endowment for International Peace Publications Department, September 2025, p. 11. https://www.belfercenter.org/sites/default/files/2025-09/Preventing%20an%20Era%20of%20Nuclear%20Anarchy.pdf

[4] Matthew Kroenig and Jonathan Rosenstein, "Nuclear priorities for the Trump administration: A time to decide," Issue Brief, Atlantic Council, December 22, 2025.

North Korea, and Israel, without resisting the dynamics of the nuclear arms race in their neighbourhoods, upgrade their nuclear arsenals.[5]

The nuclear arms race and lack of transparency can contribute to worst-case-scenario thinking among military planners and policy makers in the nuclear-armed states. Consequently, vertical proliferation will accelerate, increasing the likelihood of horizontal proliferation in the Fourth Nuclear Age. The scholars and policy-makers are inspired to move beyond nuclear deterrence to anticipate and strategise for nuclear weapons use by rebuffing the political and moral restraints associated with the nuclear taboo. The makers of modern nuclear strategy are fascinated by a horrifying yet realistic way of thinking to chalk out war plans instead of merely focusing on massive retaliatory strikes and inflicting maximum damage or mutual assured destruction. This raises a few pertinent questions about the making of nuclear strategy in the Fourth Nuclear Age. What is the impact of India and Pakistan's air combat on nuclear learning? How could nations use nuclear weapons to advance their interests? Will the fourth nuclear age be like the preceding three nuclear ages, without nuclear weapons being used in war, but propelling the nuclear arms race?

The preceding debates on the nuclear implications since the 1940s substantiate this study. Therefore, the characteristics of the previous three nuclear ages are first outlined before identifying and elaborating on a few salient features of the Fourth Nuclear Age. This reveals that the tabulation of nuclear ages is a contested feature in the literature. The two factors that drive discussion about the emergence of a new nuclear age—conventional conflicts between nuclear-armed rivals and the absence of an operative bilateral arms control treaty between Russia and the United States—have been either ignored or underappreciated in the existing literature. These factors, in conjunction with the emerging disruptive technologies that have significantly shaped the third nuclear age, will be instrumental in the new age. The study is divided into two sections. The first section discusses the Nuclear Ages. It is followed by the Salient features of the Fourth Nuclear Age.

[5] The nine nuclear-armed states, each with distinct strategic cultures and security concerns, have continued to modernize their nuclear arsenals in 2024, and some deployed new nuclear-armed or nuclear-capable weapon systems during the year. Hans M. Kristensen and Matt Korda, "World nuclear forces," SIPRI Yearbook 2025: Armaments, Disarmament and International Security, June 2025, p. 177, www.sipriyearbook.org

Section I

Nuclear Ages

The invention and use of the atomic bombs to destroy two Japanese cities, Hiroshima and Nagasaki, in August 1945, commenced the nuclear age.[6] The eight decades of nuclear proliferation can be divided into four ages. Each phase has distinct, intersecting characteristics. Notably, the organisation of these ages is debatable. Therefore, it isn't easy to reach a consensus on the tabulation of ages.[7] Andrew Futter and Benjamin Zala opined, "The concept of nuclear ages is contested, and we are not arguing that nuclear history neatly fits into distinct periods, but rather suggest that this is a useful lens through which to understand nuclear politics at a particular point in time."[8] Hence, this study doesn't contest or question the authenticity of other scholarly works on the formulation of various nuclear ages. Its phase composition is grounded on the trends. The recent academic works on nuclear politics describe the contemporary phase as a third nuclear age. However, it fails to acknowledge two dynamic developments: two nuclear-armed states have engaged in unprecedented risky air combat, and the absence of an operative arms control treaty among the great powers—China, the Russian Federation, and the United States since 2022. Presently, the nuclear-armed states are more confrontational and modernising their nuclear arsenals. No sign of moving toward nuclear disarmament under the Nuclear Non-Proliferation Treaty (NPT), the entry into force of the Comprehensive Test Ban Treaty (CTBT), and commencement of negotiations on the Fissile Material Cut-off Treaty (FMCT) at the 65-member Conference on Disarmament at Geneva. The Treaty on the Prohibition of Nuclear Weapons (TPNW) entered into force in 2021 without having a tangible impact on nuclear proliferation.[9] Mohamed ElBaradei, Director General Emeritus of the International Atomic Energy Agency (IAEA), wrote in December 2025, "Not only are major nuclear-weapon states failing to pursue arms control and

[6] In 1903, the physicist Frederick Soddy announced the phenomenon of radiation. In a popular magazine, he wrote that planet Earth was "a storehouse full of explosives," and in lectures for diverse publics, he explained the new field of nuclear physics and its possible applications.

[7] Andrew Futter and Benjamin Zala, "Strategic non-nuclear weapons and the onset of a Third Nuclear Age," European Journal of International Security, February 11, 2021. Ariel E Levite, Heading for the Fourth Nuclear Age," Proliferation Papers, Institut Francais des Relations Internationales (Ifri), Winter 2009, Nicholas L. Miller and Vipin Narang, "Is a new nucleaorganisationr age upon us? Why we may look back on 2019 as the point of no return," Foreign Affairs, December 2019, Andrew Futter, Ludovica Castelli, Cameron Hunter, Olamide Samuel, Francesca Silvestri, Benjamin Zala, The Global Third Nuclear Age: Clashing Visions for a New Era in International Politics (London: Routelge, 2025), Matthew Kroenig, "Strategic stability in the third nuclear age," Issue Brief, Atlantic Council, October 7, 2024, https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/strategic-stability-in-the-third-nuclear-age,

[8] Andrew Futter and Benjamin Zalasabre-rattling

[9] The TPNW aims to prohibit nuclear weapons and require states to destroy any existing ones. As of September 26, 2025, 74 states have ratified the treaty (party), and 25 are signatories. None of the nine nuclear-weapon states has signed it.

disarmament, they are openly doubling down on "modernizing" and expanding their arsenals to match their increasingly bellicose rhetoric."[10]

Prime Minister Narendra Modi, President Vladimir Putin, and Prime Minister Benjamin Netanyahu maintain a nuclear sabre-rattling despite the conventional balance of power in their favour, raising alarms about the increasing probability of the use of nuclear weapons. "No longer is the threat posed by nuclear weapons even tenuously contained by mutually agreed rules and accepted norms. Instead, it is returning with a vengeance, pushing us all to the edge of the abyss."[11] On November 8, 2025, U.S. Secretary of War Pete Hegseth stated, "We're not building for peacetime; we are pivoting the Pentagon and industrial base to a wartime footing."[12] Hegseth's announcement comes as President Donald Trump continues to browbeat to resume nuclear-weapon tests and employment of military muscle to pursue his strategic objectives. These developments manifest that the world has crossed the threshold into a Fourth Nuclear Age.

First Nuclear Age

During the first nuclear age, from 1945 to 1991, or the Cold War, scholars and policymakers focused primarily on the military applications of nuclear technology and materials. However, the applications of nuclear fission in medicine, agriculture, engineering, and power had also gained appreciation, but with caution due to the dual-use nature of nuclear technology. Paradoxically, the nuclear war was considered an irrational means to pursue political objectives from the beginning, but nuclear arsenals grew rapidly. The international antinuclear movements did highlight the repercussions of nuclear technology, but failed to gain tangible results. Nuclear technology, both in its peaceful and military forms, received balanced international attention, which stimulated the evolution of the nuclear nonproliferation regime aimed at nuclear arms control and disarmament, nonproliferation, and the peaceful use of nuclear technology. The entry into force of the Nuclear Nonproliferation Treaty in March 1970 divided the world between nuclear haves (five nuclear-weapon states) and nuclear have-nots (non-nuclear-weapon states). It legitimised nuclear weapons for a small group of states, while condemning their acquisition by most other states. It failed to discontinue vertical proliferation, but it succeeded to some extent in preventing the horizontal proliferation.

The Nuclear Weapon States' nuclear doctrines were grounded on the deterrence concept to ensure strategic stability. "Strategic stability is a situation in which nuclear-armed states lack the incentive to

[10] Mohamed ElBaradei, "A New Age of Nuclear Proliferation?" Project Syndicate, December 15, 2025, https://www.project-syndicate.org/magazine/new-age-of-nuclear-proliferation-by-mohamed-elbaradei-2025-12

[11] Mohamed ElBaradei, "A New Age of Nuclear Proliferation?"

[12] Jennifer Bowers Bahney, "Hegseth Says the Pentagon Is on 'Wartime Footing' In Case Our 'Adversaries FAFO'," November 8, 2025, https://www.yahoo.com/news/articles/cbs-gets-revenge-trump-60-143307453.html

conduct a nuclear first strike. Strategic stability is strengthened by secure, second-strike capabilities that give states the confidence to deter their adversaries by threatening to absorb an enemy nuclear first strike and retaliate with a devastating second strike. So long as both states understand that they cannot benefit from striking first, then nuclear deterrence should hold."[13] However, global ideological competition led to a few military crises that could have escalated into nuclear war. President John F. Kennedy himself estimated that the Cuban Missile Crisis carried a fifty-fifty chance of nuclear war. [14] The end of the Cuban Missile Crisis entailed confidence-building measures and the detente process between the superpowers. Both sides entered into bilateral arms control negotiations and arrangements—the step-by-step reduction of nuclear weapons.

Arms control negotiations can contribute to the participants' security in several ways that are not simply related to reductions in the numbers of deployed nuclear weapons. Talks between the adversaries provide participants with a channel to communicate, bring transparency to their existing forces, restrain in the invention and induction of a new generation of weapons, and predictability about their plans, which helps to manage uncertainties and dampen pressures to expand forces and capabilities in ways that could increase the costs and risks of nuclear war. "When the United States and Soviet Union participated in arms control negotiations during the Cold War, they demonstrated that they were willing to restrain their nuclear forces in the interest of averting destabilising arms races and reducing the risk of nuclear war."[15] Thus, bilateral arms control negotiations bolstered strategic stability.

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[13] Matthew Kroenig, "Strategic stability in the third nuclear age," Issue Brief, Atlantic Council, October 7, 2024, https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/strategic-stability-in-the-third-nuclear-age/

[14] Matthew Kroenig, "Strategic stability in the third nuclear age," Issue Brief, Atlantic Council, October 7, 2024, https://www.atlanticcouncil.org/in-depth-research-reports/issue-favourablebrief/strategic-stability-in-the-third-nuclear-age/

[15] Amy F. Woolf, "Promoting Nuclear Disarmament through Bilateral Arms Control: Will New START Extension Pave the Path to Disarmament?" Journal for Peace and Nuclear Disarmament, Vol. 4, Issue 2, 2021, https://doi.org/10.1080/25751654.2021.1992favourable217

Second Nuclear Age

The second nuclear age, from 1991 to 2003, was conducive to nuclear arms control and a nuclear non-proliferation regime in the beginning. Washington and Moscow signed a series of formal arms control agreements and reduced the size of their arsenals from tens of thousands of nuclear weapons. South Africa voluntarily dismantled its nuclear weapons between 1989 and 1991, and joined the NPT as a Non-Nuclear-Weapon State in July 1991. This made South Africa the first – and, until today, the only – country known to have built and then dismantled its entire nuclear-weapons capability, and to have subsequently adhered to the non-proliferation regime by joining the NPT.[16] In 1993, the United Nations unanimously passed a resolution 78/57L called the Fissile Material Cut-Off Treaty (FMCT) to prohibit the production of the two main components of nuclear weapons: highly-enriched uranium (HEU) and plutonium.[17]

The NPT was extended indefinitely in 1995, the draft of the Comprehensive Test Ban Treaty was approved, and it was opened for signature and ratification in September 1996. With the indefinite extension of the NPT, "the legally recognised nuclear weapons states (NWS) legitimised their stockpiles as 'hedges against future uncertainties, while the 'real' problem with nuclear weapons was defined as preventing 'horizontal proliferation.'"[18] Besides, there was a significant downsizing of Russia's and the U.S. nuclear arsenals. The British and the French have decreased their nuclear arsenals and eliminated one or more legs of their Triad. All the nuclear-weapon states (P-5) imposed national moratoria on nuclear testing.[19] However, these developments did not signal a walk away from the core logic underlying nuclear deterrence. Therefore, a favourable environment for non-proliferation was short-lived.

India and Pakistan's nuclear weapon tests in May 1998 heralded their entry into the Nuclear Club as de facto nuclear-weapon states.[20] They did not violate any legal undertakings, but there was a palpable sense of violation of hard-won and cherished norms against horizontal proliferation. The May tests signified that the nuclear non-proliferation regime and the U.S. sanctions mechanism failed to prevent insecure states from acquiring nuclear weapons. India and Pakistan's nuclearisation has not started a chain reaction or instigated another state to advance its nuclear weapon program, but has increased the risk that other states might try to emulate them. Neither state deployed nuclear weapons, but a vigorous capability race involving missiles, warhead design, and fissile material commenced.

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[16] Robin E. Möser, South Africa's disarmament and its ramifications: From the NPT to the Treaty of Pelindaba and MTCR adherence, 1988–1995," Journal of Strategic Studies, July 03, 2025, https://www.tandfonline.com/doi/full/10.1080/01402390.2025.2522276#abstract

[17] Daryl Kimball, "Fissile Material Cut-off Treaty (FMCT) at a Glance," Fact Sheets and Briefs, Arms Control Association, November 2024.

[18] Benoît Pelopidas, Hebatalla Taha, and Tom Vaughan, "How dawn turned into dusk: Scoping and closing possible nuclear futures after the Cold War," Journal of Strategic Studies, January 03, 2024, https://doi.org/10.1080/01402390.2023.2290441

[19] Ariel E Levite, Heading for the Fourth Nuclear Age," Proliferation Papers, Institut Francais des Relations Internationales (Ifri), Winter 2009, p. 19.

[20] India and Pakistan are considered de facto nuclear weapon states, instead of de jure nuclear weapon states, because they exploded a nuclear device after January 1, 1967. See NPT.

The American strategic pundits concluded that the rogue states, such as North Korea, Iran, Iraq, Syria, and Libya, pose serious threats to U.S. security because of their modest ballistic missile capabilities, coupled with their antagonism towards the US and its allies.[21] They believe that credible deterrence can no longer be based solely on the prospect of punishment through massive retaliation. So, to complement nuclear deterrence, they recommended strategic missile defences. They seemed convinced that missile defences complement and reinvigorate classical nuclear (and conventional) deterrence by providing a measure of protection against rogue nuclear possessors. The Rumsfeld Commission concluded in July 1998: "Concerted efforts by a number of overtly or potentially hostile nations to acquire ballistic missiles with biological or nuclear payloads pose a growing threat to the United States, its deployed forces, and its friends and allies."[22] The commission report strengthened support for the United States' National Missile Defence systems. House National Security Committee Chairman Floyd Spence (R-SC) said, "The commission's work reinforces my views on the urgency of committing to the deployment of missile defences to protect the American people as soon as possible."[23] The report anticipated an environment in which quashing the 1972 Anti-Ballistic Missile (ABM) Treaty had become a prerequisite for pursuing both theatre and national ballistic missile defence (BMD) systems.[24] On May 1, 2001, US President George W. Bush announced a strategic framework based on deterrence concepts that rely on both offensive and defensive forces. He pointed

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[21] Dean A. Wilkening, 'Ballistic Missile Defence and Strategic Stability', Adelphi Paper 334 (New York: Oxford University Press, 2000) p. 9.

[22] "Commission to Assess the Ballistic Missile Threat," Federation of American Scientists, https://irp.fas.org/threat/bm-threat.htm, accessed on December 25, 2025.

[23] Craig Cerniello, "Rumsfeld Panel Releases Report on Missile Threat to U.S.," Arms Control Today, July 1998, https://www.armscontrol.org/act/1998-06/press-releases/rumsfeld-panel-releases-report-missile-threat-us.

[24] Russia and the United States first tackled the offense-defense balance in the 1972 Anti-Ballistic Missile (ABM) Treaty. Presently, no one wants to negotiate another ABM Treaty.

out that deterrence was no longer based solely on the threat of nuclear retaliation. "We need a new framework that allows us to build missile defences to counter the different threats of today's world. To do so, we must move beyond the constraints of the 30-year-old ABM Treaty. This treaty does not recognise the present or point us to the future. It enshrines the past."[25] Following it, the U.S. exited from the Treaty in June 2002. The U.S. withdrawal from the ABM Treaty led to its demise and accelerated the development of ballistic missile defences in the U.S., Russia, China, and India.

Third Nuclear Age

The third nuclear age is thought to have begun in 2003 and ended in 2019. The nuclear analysts were worried about horizontal proliferation–the spread of nuclear weapons to new states, which are party to the NPT, such as Iran, Iraq, North Korea, and Libya, and even non-state terrorist groups. The probability of nuclear and radiological terrorism was taken seriously by the Western leadership because terrorist organisations tried to get nuclear devices for their terrorist acts. According to American findings, Osama bin Laden had stated that acquiring nuclear weapons was a "religious duty," and the IAEA concluded that al Qaeda was "actively seeking" an atomic bomb.[26] Iraq was singled out as the preeminent villain of the proliferation discourse, identified as the paradigmatic rogue state striving for nuclear weapons.

To prevent Iraq or horizontal proliferation, the U.S. launched a preventive war against the Saddam Hussein regime in Iraq in March 2003. The basic supporting proposition for Operation Iraqi Freedom was that Baghdad possessed weapons of mass destruction (WMD). In March 2004, while justifying his stance on the invasion of Iraq, British Prime Minister Tony Blair restated his pre-war position. He said, "It is a matter of time unless we act and take a stand before terrorism and WMD come together, and I regard them as two sides of the same coin."[27] The consequences of an act of WMD terrorism would be devastating in many respects — human, social, psychological, economic, and political. The Operation Iraqi Freedom generated optimism for hindering horizontal proliferation. However, optimism vanished when the Democratic People's Republic of Korea (North Korea) withdrew from the NPT on April 10, 2003,[28] built an unsafeguarded fissile material stockpile, and conducted a nuclear test in 2006. It was recognised by the international community as a de facto nuclear power following its 2009 nuclear test. This was the first time a state had left the NPT. Its withdrawal has created a major challenge to the NPT regime by setting a precedent for determined proliferators to acquire nuclear capabilities under the guise of peaceful use before leaving the treaty.

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[25] `President Bush's Speech on Nuclear Strategy', Arms Control Today, June 2001.

[26] "Nuclear Terrorism" A Briefing Paper, International Physicians for the Prevention of Nuclear War, accessed on 13 October 2004.

[27] Quoted in Lawrence Freedman, "War in Iraq: Selling the threat," Survival, vol. 46, no. 2, Summer 2004, p. 17.

[28] Jean du Preez and William Potter, "North Korea's Withdrawal From the NPT: A Reality Check," Middlebury Institute of International Studies at Monterey, April 8, 2003, https://nonproliferation.org/north-koreas-withdrawal-from-the-npt-a-reality-check/

The India-U.S. nuclear deal, signed in 2005, entailed the Nuclear Suppliers Group (NSG) granting India a waiver in 2008, thereby eroding the group's credibility. The deal was inspired by commercial and strategic interests—to build up India as a strategic counterweight to China. "This development would signal for all to see that the sanctity of the established nuclear order has finally been formally compromised and, in turn, would further contribute to its disintegration."[29] Within the region, India and Pakistan were on a positive learning curve in managing their nuclear relationship. Admittedly, strategic rivalry persisted between them despite the U.S. cultivating closer strategic cooperation with both. India's compellence strategy had few dividends, but Pakistan's nuclear deterrence prevented escalation of the conflict despite the close calls during the 2001-2002 ten-month eyeball-to-eyeball military deployments and 2008 Mumbai terrorist attacks. Islamabad responded responsibly to New Delhi's claim about surgical strikes against Pakistan in 2016. Besides, both states' nuclear weapons qualitatively and quantitatively increased, and their nuclear doctrines transformed. Pakistan announced credible minimum Full Spectrum Deterrence, and India moved to a nuclear counterforce and escalation dominance strategy toward Pakistan, and signalled swapping its no-first-use with first-use nuclear policy.[30] It sought to acquire the components (accurate and responsive nuclear delivery systems, an array of surveillance platforms, and sophisticated missile defences) imperative to launch counterforce strikes.[31]

The authors of *The Global Third Nuclear Age: Clashing Visions for a New Era in International Politics* summarised the characteristics of the third nuclear age. They wrote: *The nuclear-armed "great powers" appear increasingly locked in geopolitical competition as the world moves from a unipolar to multipolar system; rapid technological change is creating the potential for enhanced nuclear and strategic non- nuclear weapons with different and destabilising mission sets; international norms, consensus and arms control edifices that have formed the bedrock of the global nuclear order are slowly eroding; state and especially NGO-based disarmament activism is on the rise at the same time as interest in–and the salience of–nuclear technology for both military and non-military purposes is firmly back on the political agenda; and we increasingly see a set of very different and contested visions of the nuclear future. Arguably, the global nuclear order – and the nuclear peace that this order is ostensibly designed to maintain–is under more pressure than ever. For this reason, we argue that the world is moving into a Third Nuclear Age.*[32]

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[29] Ariel E Levite, Heading for the Fourth Nuclear Age," p. 24.

[30] Defense Minister Manohar Parrikar stated, "A lot of people say India has a no-first-use nuclear policy, but why should I bind myself? I should say I'm a responsible nuclear power, and I will not use it irresponsibly." "India Should Not Bind Itself to a 'No First Use Nuclear Policy,' says Manohar Parrikar," Scroll, November 10, 2016, https://scroll.in/latest/821251/india-should-not-bind-itself-to-destabilisingdefencebehaviourdefencemodernisinga-no-first-use-nuclear-policy-says-manohar-parrikar

[31] Christopher Clary, Vipin Narang, "India's Counterforce Temptations: Strategic Dilemmas, Doctrine, and Capabilities Free," International Security, Vol. 43, Issue 3, Winter 2018/19.

[32] Andrew Futter, Ludovica Castelli, Cameron Hunter, Olamide Samuel, Francesca Silvestri, Benjamin Zala, The Global Third Nuclear Age: Clashing Visions for a New Era in International Politics, p. 1.

Section II

Fourth Nuclear Age: Dicey Developments

Great-power strategic competition and nuclear-tinged crises in the multipolar world have renewed an arms race that challenges the existing deterrence paradigm. On August 1, 2024, Vipin Narang, the then acting assistant secretary of defence for space policy, stated that the United States has entered "a new nuclear age," entailing a shift from an approach seeking a balance between deterrence and arms control toward a more competitive approach reminiscent of the Cold War, necessitating modernising and expanding the U.S. nuclear arsenal. It is grounded on at least three core assumptions: coordinated adversarial behaviour, the plausibility of limited nuclear employment, and the failure of arms control efforts.[33] Hence, in the new nuclear age, strategic thinkers must refurbish nuclear doctrines that focus on practical nuclear warfighting strategies for defence rather than on deterrence stability, which shape and guide nuclear-armed countries' nuclear force structures, deployments, and postures. They have to devote serious attention to the complex concepts such as intra-war deterrence, escalation management, and conflict termination between the nuclear-armed rivals. The development and integration of destabilising technologies into military systems will continue to shape the strategic landscape. The proliferation of these technologies in multipolar competition will usher in the fourth nuclear age, accelerating a new arms race with revolutionary weapons that challenge the existing deterrence paradigm and propel us to the edge of the abyss.

Edge of the Abyss

One of the specific reasons to depart from the third nuclear age is that the increasing significance of nukes in nuclear-armed states' strategic calculations and risk of nuclear weapons use due to increasing conventional wars between nuclear-armed rivals, nuclear-armed state aggression against the latent nuclear-weapon state, and nuclear-armed state frustration in a protracted asymmetrical warfare with a conventionally weaker state supported by a nuclear-armed coalition. Graham Allison raised a pertinent question, i.e., "How unnatural it is that states have been willing not to have their own nuclear arsenals, particularly after they see what happened to Ukraine and now to Iran?"[34]

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[33] Reja Younis, "A New Nuclear Age?" Center for Strategic and International Studies, August 2024, https://www.csis.org/analysis/new-nuclear-age.

[34] John Mecklin, "Interview: Harvard's Graham Allison on the second Trump administration and the international security order," Bulletin of the Atomic Scientists, September 4, 2025, https://thebulletin.org/premium/2025-09/interview-harvards-graham-allison-on-the-second-trump-administration-and-the-international-security-order/

The current nuclear order is discriminatory; it has always had to treat some as being more equal than others. Therefore, it will not continue, and many militarily insecure states can develop their own nuclear warfighting potential or nuclear deterrence after learning from the Ukrainian and Iranian experiences. In the words of Mohammed ElBaradei, "So, the message is that, if you want the ultimate security guarantee, you must have the bomb; and that if you do have it, you can get away with murder. Ukraine, a country that agreed to give up its nuclear weapons in exchange for security guarantees, understands this all too well." [35] The general perception is that states acquiring nuclear weapons increase conventional stability. "Conventional stability is a measure of the likelihood of conventional military conflict; as the possibility of conventional conflict decreases, conventional stability increases due to the fear of escalation of conflict to the nuclear level. So a state's development of a nuclear weapons capability increases conventional stability by lowering the likelihood that the state will have to engage in a conventional war."[36] The stability-instability paradox holds that the probability of nuclear use declines and increases nuclear stability, while the possibility of conventional conflict rises and reduces conventional stability.

The recent developments reveal that in the case of India and Pakistan, the nuclear weapons are neither increasing conventional stability nor nuclear stability. "The inverse relationship between the likelihood of nuclear and conventional war, captured in the stability-instability paradox, is an essential characteristic of nuclear weapons. As long as nuclear weapons exist, the stability-instability paradox and its attendant challenges will remain with us."[37] The contributing factors to nuclear and conventional instability in South Asia are India's conventional superiority, its nuclear counterforce capability, and its adoption of a preemptive counterforce posture. "India's adoption of nuclear counterforce— or even Pakistan's fear of its adoption—could generate not just an arms race, but dangerous first-strike instability where neither side could afford to go second." [38] Thus, the Fourth Nuclear Age will be highly perilous.

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[35] Mohamed ElBaradei, "A New Age of Nuclear Proliferation?" Project Syndicate, December 15, 2025, https://www.project-syndicate.org/magazine/new-age-of-nuclear-proliferation-by-mohamed-elbaradei-2025-12

[36] S. Paul Kapur, "Stability-Instability Paradox," in Fathali M. Moghaddam, ed. The SAGE Encyclopedia of Political Behavior (Thousand Oaks: SAGE nuclearisedPublications, Inc. 2017), http://dx.doi.org/10.4135/9781483391144.n364

[37] Ibid.

[38] "A shift to incorporating nuclear counterforce options may be an attempt to escape India's strategic paralysis following Pakistan's development of tactical nuclear weapons, which Pakistan threatens to use against Indian conventional forces should they cross certain red lines." Christopher Clary, Vipin Narang, "India's Counterforce Temptations: Strategic Dilemmas, Doctrine, and Capabilities Free."

India-Pakistan Strategic Riddle

India and Pakistan's enduring enmity is a strategic puzzle with a built-in characteristic of nuclear war in the Fourth Nuclear Age. Since February 2000, India has been working on its doctrine of limited war under the nuclear threshold. It became the first nuclear power to attack another nuclear state with missiles and air strikes in February 2019 and May 2025. Though India claimed to conduct surgical strikes in September 2016, Pakistan refuted the proclamation. In these military adventurisms, the Indian Air Force paid a high cost. For instance, India's two fighter jets were destroyed, and a pilot was arrested in air combat with Pakistan on February 27, 2019, and again lost seven fighter planes and immense military infrastructure in four-day skirmishes in May 2025. Realistically, there are limits to military adventurism against a rival that is professionally trained and equipped with modern weaponry and battle-hardened armed forces. Moreover, a compellence strategy is not advisable against nuclear-armed adversaries, and it treats a challenger's nuclear capability as a mere bluff.[39] Assuming it remains below the nuclear threshold, the limited war launched is a risky gamble. The probability of the escalation of a limited war to an all-out war entailing the use of nuclear weapons is a distinct possibility between the nuclearised strategic rivals. Thus, punitive strikes against a nuclear-armed rival could lead to retaliatory nuclear strikes.

India has harboured hegemonic or Great Power ambitions in South Asia and has struggled against Pakistan for escalation dominance, despite its strategic reputation and military losses.[40] Escalation dominance is "a condition in which a combatant has the ability to escalate a conflict in ways that will be disadvantageous or costly to the adversary while the adversary cannot do the same in return, either because it has no escalation options or because the available options would not improve the adversary's situation."[41] The Indian strategic pundits advocated for swapping the No First Use (NFU) nuclear policy and massive retaliation doctrine with a doctrine of flexible response to acquire multiple offensive nuclear options. They argued that a flexible response posture would provide India with many options to address the range of contingencies that might arise and enable it to escalate its dominance. India's resolve to achieve escalation dominance manifested in its evolving strategic behaviour in both

[39] The compellence strategy is defined as: "If a state possesses the capability to compel a target, the target may choose to make concessions to avoid a crisis and dampen the risk of conflict." Nicholas D. Anderson, Alexandre Debs, Nuno P. Monteiro, "General Nuclear Compellence: The State, Allies, and Adversaries," Strategic Studies Quarterly, Fall 2019, pp. 93-121, 93.

[40] Today, the American strategic community might be soul-searching if it were betting on the right horse to stand up against a rising China. This is because India's international standing, military capabilities, and its ability to be a great power in South Asia were severely exposed in four-day skirmishes in May 2025. Moreover, the Modi cabinet members' baseless accusations, the Indian diplomatic corps, and the hawkish media narrative about Pakistan-originated terrorism mantra have no traction in the international community.

[41] Forrest E. Morgan, Karl P. Mueller, Evan S. Medeiros, Kevin L. Pollpeter, Roger Cliff, Dangerous Thresholds: Managing Escalation in the 21st Century, RAND Corporation, 2008, p.15, https://www.rand.org/content/dam/rand/pubs/monographs/2008/RAND_MG614.pdf

the nuclear and conventional domains. It deployed its nuclear assets during the 2019 Pulwama military standoff.[42] The then Defence Minister Rajnath Singh explicitly stated that India's commitment to NFU "depends on the circumstances."[43]

The shift in India's strategic posture from a counter-value to a counterforce orientation, as evidenced by its weaponry (Agni-P canisterized missile, BrahMos cruise missile, hypersonic Shaurya missile, BMD systems, ASAT weapon, robust ISR network, etc.), and officials signalling a swap from NFU to First Use (FU) nuclear policy. India's adoption of a preemptive counterforce posture is grounded in escalation dominance, which marked a shift in its nuclear doctrine and the death knell of its so-called credible minimum deterrence. Specifically, India adopted the logic of a limited-war option, including counterforce, to change the deterrence equation with Pakistan and achieve escalation dominance. The main problem with the counterforce posture lay in its inevitable association with a preemptive first strike. A first strike aimed at an opponent's military facilities and weapons systems could effectively disarm the enemy. Thus, the counterforce is associated with an offensive rather than a defensive doctrine.

The worrying aspect of the recurring crises between India and Pakistan since their nuclearisation in May 1998 is that each crisis (six in the past 25 years) has introduced new facets of instability.[44] The Pahalgam military standoff in May 2025 was the sixth crisis between India and Pakistan during the

[42] Zafar Nawaz Jaspal, India's Surgical Strike Stratagem: Brinksmanship and Response, Revised Edition, National Institute of Historical and Cultural Research (NIHCR), Quaid I Azam University, 2024.
[43] Mayank Singh, "Rajnath googly on the future of nuclear no first use doctrine," The New Indian Express, August 17, 2019.
[44] The six crises between India and Pakistan are: May 1999 Kargil, 2001-2002 military standoff, 2008 Mumbai terrorist attack, 2016 Uri, India's claimed surgical strikes in September 2016, 2019, Pulwama attack, and India's surgical strikes leading to air combat between IAF and PAF on February 27, 2019, and 2025 Pahalgam skirmishes.

past 25 years. "Also consistent with previous crises, Pakistan called for an investigation into the attack and signalled its preference for calm, while simultaneously emphasising that it will respond in kind to any Indian use of force."[45] Every crisis amplified belligerence, augmented the arms race, leading to the modernisation of military doctrines and the upgrading of conventional and nuclear arsenals. The four-day intense skirmish in May 2025 (also referred to as the 88-hour war of May 2025), like the earlier crises, revealed that neither India nor Pakistan was prepared to rely exclusively on the nuclear deterrent to stabilise the strategic equation between them.[46]

The risk of termination of the current ceasefire and recommencement of war persists between the nuclear-armed India and Pakistan. The ceasefire remains fragile because it does not address any of the underlying grievances in the bilateral relationship. Despite Islamabad's olive branch, New Delhi stubbornly refused to restart the dialogue process aimed at normalising the situation. Prime Minister Narendra Modi's combative rhetoric and the BJP's electioneering strategy in states strengthened hawkish views in India and Pakistan. Premier Modi said it's just a "pause."[47] Defence Minister Rajnath Singh added, "Operation Sindoor is not over yet. Whatever happened was just a trailer. When the right time comes, we will show the full picture to the world."[48] To appease the hawkish lobby in the country, Pakistani leaders are attempting to strike a balance between their demand for dialogue and sustainable peace while ensuring that the sovereignty of the state is preserved at all costs. So a conventional war between nuclear-armed India and Pakistan appears increasingly plausible. Hence, another crisis between them is not a question of if, but when.

India launched *Operation Sindoor*, a combined air-missile assault on various locations in Pakistan and Pakistan-administered Kashmir before dawn on May 7, 2025. From May 6 to 10, 2025, it employed high-tech air, ballistic, and cruise missiles, as well as drone strikes. It used the BrahMos, a supersonic cruise missile, to evade air defence systems and decimate targets deep inside Pakistan. Firing a BrahMos cruise missile was a significant deviation from the pattern of past crises. India was also prepared to launch ground operations.

On January 13, 2026, Army Chief of India General Upendra Dwivedi revealed, "In those 88 hours, you saw that the Army's mobilisation to expand the conventional space was such that if Pakistan made any mistake, we were fully prepared to launch ground operations."[49] He also claimed that a space for

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[45] Moeed W. Yusuf, "Brokered Bargaining in Nuclear South Asia: U.S. Mediation in the India-Pakistan Pahalgam Crisis," Arms Control Today, July/August 2025, https://www.armscontrol.org/act/2025-07/features/brokered-bargaining-nuclear-south-asia-us-mediation-india-pakistan-pahalgam#endnote01

[46] Dr. Walter Ladwig, "Calibrated Force: Operation Sindoor and the Future of Indian Deterrence," Royal United Services Institute, May 21, 2025, https://www.rusi.org/explore-our-research/publications/commentary/calibrated-force-operation-sindoor-and-future-indian-deterrence.

[47] "India's Modi Says Fighting 'Only Paused' in Wake of Conflict with Pakistan," Al Jazeera, May 12, 2025.

[48] "'Op Sindoor was just a trailer,' says Rajnath Singh at Bhuj Air station, praises Force's bravery," The Print, May 16, 2025, https://theprint.in/india/rajnath-singh-says-operation-sindoor-is-just-a-trailer-praises-indian-airforces-bravery/2627910/

[49] Shivani Sharma, "India was ready to launch ground offensive: Army Chief's big reveal on Op Sindoor," India Today, January 13, 2026, https://www.indiatoday.in/india/story/army-chief-gen-upendra-dwivedi-india-pakistan-ceasefire-op-sindoor-terrorism-2851100-2026-01-13?utm_source=substack&utm_medium=email

conventional operations was expanded. He pointed out, "This time, the action we took — especially the kind of firing that took place in Jammu and Kashmir and the way we addressed it — showed that we expanded the conventional space."[50] In retaliation, Pakistan propelled Operation Bunyan-um-Marsoos, involving air strikes, long-range missiles, drones, and cyber warfare against Indian 26 key military installations in the Indian Illegally Occupied Jammu and Kashmir (IIOJK) and mainland India, including air force bases, logistics hubs, command centres, and missile storage facilities. It successfully neutralised India's air defence grid, Rafales, and S-400 Triumf surface-to-air missile defence system. Thus, during a four-day intense skirmish, the two sides deployed new-generation technology, missiles with conventional ammunition, armed drones, and advanced fighter jets in their heartlands, which were untouched since the 1971 war, and the disputed territory of Kashmir, and exchanged massive artillery fire at the Line of Control.

The intense four-day skirmish has not broken nuclear deterrence, yet undeniably shaken it due to the moving up the escalation ladder and assertive military postures of India and Pakistan.[51] New Delhi and Islamabad officially pronounced that their military actions were measured, non-escalatory, proportionate, and responsible. They endeavoured to influence each other's cost-benefit analyses through calibrated kinetic actions, presuming that standard deterrence principles would prevent a disastrous escalation and an apocalyptic outcome.[52] Crossing the missile threshold heightens the danger deriving from conventional/nuclear ambiguity. It introduced dangerous first-strike instability between India and Pakistan. Though the May 2025 skirmishes confirm that there is a space for conventional war, India and Pakistan are inclined to advance nuclear forces and adopt deployment and employment patterns that increase the risk of nuclear escalation in any future military conflict.

Notwithstanding experiencing embarrassment, India has threatened to launch Operation Sindoor 2 against Pakistan. Prime Minister Narendra Modi announced a "new normal" on May 12, 2025. He warned that conventional military strikes would follow if Pakistan-based terrorist groups launched another attack on Indian soil. He stated, "Operation Sindoor has redefined the fight against terror, setting a new benchmark and a new normal" in counter-terrorism measures.[53] This operation, in essence, presumes that any terror attack in India is sponsored by the Pakistani establishment, specifically the Pakistani army and the Inter-Services Intelligence (ISI). Modi emphasised that India "will not tolerate any nuclear blackmail" and "will not differentiate between the government sponsoring terrorism and the masterminds of terrorism ."[54] It reveals that Premier Modi and the Indian military establishment believe that there is space for a limited conventional and punitive war against Pakistan despite the nuclear overhang; secondly, the nuclear parity and conventional deterrence

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[50] Ibid.

[51] For understanding India and Pakistan postures, see Zafar Nawaz Jaspal, Nuclear Arms Control in South Asia: Politics, Postures, and Practices (Karachi: Paramount Books, 2024).

[52] Christopher Clary, "Four Days in May: The India-Pakistan Crisis of 2025," Stimson Center, May 28, 2025, https://www.stimson.org/2025/four-days-in-may-the-india-pakistan-crisis-of-2025/.

[53] "PM addresses the nation," News Updates, May 12, 2025, https://www.pmindia.gov.in/en/news_updates/pm-addresses-the-nation-5/

[54] Srujan Palkar and Mrittika Guha Sarkar, "Amid India-Pakistan tensions, the US must rebalance its security priorities in South Asia," Atlantic Council, May 19, 2025.

would not escalate the war into the nuclear domain; and thirdly, if the situation escalates into the unthinkable, Pakistan does not have the resolve to use its nuclear weapons.

Pakistan, however, categorically rejected the new normal. It insisted that respect for sovereignty and territorial integrity remains the only acceptable standard in inter-state ties. On May 16, 2025, Foreign Office spokesman Shafqat Ali Khan said, "While India propagates the notion of establishing a 'new normal' in bilateral relations, our restrained response has reaffirmed that the only acceptable norm is respect for sovereignty and territorial integrity."[55] Pakistani security observers are debating the need to revisit Pakistan's current credible minimum full-spectrum nuclear deterrence to restructure it into a flexible, tailored deterrence. With a full toolbox of conventional, cyber, space, missile defence shield (against ballistic, hypersonic, advanced cruise missiles, and other next-generation aerial attacks), and a range of nuclear capabilities (varying yields and delivery systems), from low-yield, limited options (counterforce) to large-scale (countervalue) attack options. So that Pakistani defence policymakers will be better positioned to deter India's aggression, address crises, and, if necessary, manage escalation before and during conflict, and above all, prevent the adversary's escalation dominance. Besides, make it obvious to India that a nuclear strike is possible, even in response to a non-nuclear, strategic attack.[56]

Since the Pahalgam attack on April 22, 2025, India has used all the instruments of hybrid warfare and grey zone warfare. It has initiated disinformation, media jingoism, psy-ops, weaponised river water, etc, to malign Pakistan and terrorise Pakistani society. To pressurise Pakistan, India unilaterally declared the 1960 Indus Water Treaty (IWT) in abeyance, "an ambiguous term neither found in the treaty's text nor recognised in international law."[57] The Treaty protects the overwhelming majority of Pakistan's water supply. India's Home Minister Amit Shah reiterated on June 21, 2025, that New Delhi will never restore the IWT with Islamabad. The Indian ruling elite opined that the water flowing to Pakistan would be diverted for internal use. Amit Shah said, "We will take water that was flowing from Pakistan to Rajasthan by constructing a canal. Pakistan will be starved of water that it has been getting unjustifiably." Conversely, Pakistan remains firmly committed to the IWT and expressed its resolve to take all necessary measures to protect its legitimate rights and entitlements under the Treaty. It maintains a clear stance that violating IWT and diverting river water flowing to Pakistan will be considered "an act of war."[58] On August 9, 2025, Pakistan's Army Chief Field Marshal Asim Munir said, "We will destroy any Indian dam built to control the Indus River with 10 missiles", addressing India's decision to suspend the Indus Waters Treaty governing distribution of water in the river.[59]

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[55] "Transcript of the Weekly Media Briefing by the Spokesperson on Friday, 16 May 2025," Ministry of Foreign Affairs, Government of Pakistan, May 16, 2025. https://mofa.gov.pk/press-releases/transcript-of-the-weekly-media-briefing-by-the-spokesperson-on-friday-16th-may-2025?mission=media-briefings

[56] Zafar Nawaz Jaspal, "Escalation dominance vs flexible tailored deterrence," Pakistan Observer, January 13, 2026, https://pakobserver.net/escalation-dominance-vs-flexible-tailored-deterrence/

[57] Jeremy Allouche, "Will Nationalism, Illiberalism, and Climate Change Lead to Water Wars?" Current History, January 2026, p. 29.

[58] Pakistani Prime Minister's Office, "Prime Minister Muhammad Shehbaz Sharif Chaired a Meeting of the National Security Committee (NSC), Today," Press Release, Prime Minister's Office, April 24, 2025.

[59] Siddhant Kishore, "The illusion of deterrence: Why India isn't buying Pakistan's nuclear threats," The Bulletin of the Atomic Scientists, November 29, 2025.

Since the May 2025 conflict, calls to strengthen conventional forces have been frequently heard in India and Pakistan, reflecting and furthering debate over the wisdom of relying on nuclear deterrence. Both sides' preparedness to fight a war to settle their disputes under the looming threat of nuclear use would not only destabilise South Asia but also challenge long-held assumptions about the credibility of nuclear deterrence itself. It raises a few basic questions. What is deterrence? What is it for? What would it actually mean if deterrence fails? How will deterrence work with multidomain warfare? "Deterrence, in its pure form, entails no ability to defend; a deterrent strategy promises not to fend off an aggressor but to damage or destroy what the aggressor holds dear."[60] Importantly, both deterrence and defence are strategies that a status quo state may employ to dissuade an adversary from attacking.

Nuclear-armed India and Pakistan consider each other as revisionist states. It seems they have adopted a strategy of Flexible Response, i.e., the ability to meet threats at all levels, from irregular warfare to conventional to nuclear warfare. Neither India nor Pakistan is ready to adopt a no-first-use nuclear policy. They are preparing to fight a multidomain conventional war in a nuclearised strategic environment. "Decades ago, the term strategic forces was synonymous with nuclear weapons; now it refers to weapons with potential strategic effect such as missile defences, advanced conventional strike including hypersonic missiles, cyber and space capabilities, artificial intelligence, and more."[61] Therefore, spending on conventional precision-strike systems of various types has increased. On January 3, 2026, the Pakistan Air Force (PAF) successfully conducted the flight test of the indigenously developed Taimoor air-launched cruise missile, capable of engaging enemy land and sea targets with high precision at a range of 600 kilometres, carrying a conventional warhead. The Inter-Services Public Relations (ISPR) stated, "Its precision-strike capability significantly enhances the conventional deterrence and operational flexibility of PAF, further strengthening the country's overall defence posture."[62] On August 13, 2025, Pakistan also announced the formation of a new Army Rocket Force Command (ARFC) to enhance its conventional warfare capabilities.[63]

The puzzling factor in nuclear-armed India and Pakistan is that they are reciprocating a Cold War arms race, but are unprepared to take measures that ensure strategic stability between the superpowers, such as engaging in a dialogue about their respective nuclear deterrence postures and doctrines. The absence of dialogue only increases misunderstanding and misperceptions about intentions, thereby enhancing the risk of a nuclear catastrophe. During the Cold War, analysts had a consensus that a nuclear war between the U.S and the Soviet Union would be the result of escalation from a conventional conflict. Therefore, Moscow and Washington adopted several measures to reduce the risk that misunderstandings or miscalculations could lead to conventional conflict and, potentially, nuclear escalation. "Among other steps, they established communications links that allowed

[60] Kenneth N. Waltz, "Nuclear Myths and Political Realities," The American Political Science Review, Vol. 84, No. 3, September 1990, p.732.

[61] Matthew Kroenig, "Strategic stability in the third nuclear age."

[62] "Pakistan Air Force successfully tests indigenously developed air-launched cruise missile," Dawn, January 3, 2026.

[63] Muhammad Naveed Qaisar, "Pakistan's New Rocket Force: Strategic Deterrence and Escalation Risks," South Asian Voices, September 30, 2025, https://southasianvoices.org/sec-m-pk-n-pakistan-rocket-force-09-30-2025/

consultation during crises, pledged to provide notifications of activities like missile launches and military exercises that might lead to misunderstandings, and agreed to avoid threatening or ambiguous actions by their military forces that might raise concerns of an impending attack."[64]

The absence of communication brought India and Pakistan to the brink of crisis on March 9, 2022, due to the firing and crashing of an Indian supersonic missile in Pakistani territory.[65] New Delhi's delay in announcing the causes of the missile misfire (technical malfunction during routine maintenance), suspension of the mutual channel of communications, absence of prearrangement to deal with such a grave situation diplomatically, and deadlock in relations since the 2019 post-Pulwama military standoff collectively contributed to Pakistan's interpretation of the incident, i.e., "it was not a technological error but a deliberate fire with ulterior strategic objectives." Islamabad warned Delhi to "be mindful of the unpleasant consequences of such negligence" and to avoid a repeat.[66] The deadlock between New Delhi and Islamabad, and Prime Minister Modi's war mongering and nuclear sabre-rattling alarm about the risk of miscalculation, escalation, and nuclear use. Thus, the absence of bilateral arms control and nuclear risk reduction measures between India and Pakistan is increasing the existential risk of nuclear war in South Asia.

The U.S. played a critical role in de-escalating six crises between nuclear-armed India and Pakistan. President Trump had prevented the escalation of a conflict in February 2019 and again in May 2025. On numerous occasions, President Trump claimed that he stopped a nuclear conflict between India and Pakistan on May 10, 2025. He said, "We stopped a nuclear conflict. I think it could have been a bad nuclear war … so, I'm very proud of that. I said to India and Pakistan: Let's stop it. If you stop it, we'll do trade. If you don't stop it, we're not gonna do any trade … and all of a sudden, they said, 'I think we're gonna stop."[67] The Pakistani ruling elite openly appreciated his role in de-escalating the conflict and recommended him for the 2026 Nobel Peace Prize. However, the Indian ruling elite is shy to admit that the Trump administration helped broker a ceasefire between India and Pakistan on May 10, 2025. It downplayed the role of the third party.

On June 17, 2025, India's Foreign Secretary Vikram Misri claimed that Prime Minister Modi told President Trump during a phone call that New Delhi would never accept third-party mediation with Pakistan on the issue of Kashmir. Prime Minister Modi is unprepared to heed Trump's advice to promote bilateral trade and investment rather than fight each other. Accepting a third-party role in resolving bilateral conflicts between India and Pakistan is viewed as a suicidal political choice for Modi and his cohort in the prevalent Indian polity. "While the third parties' refusal to unequivocally censure

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[64] Amy F. Woolf, "Promoting Nuclear Disarmament through Bilateral Arms Control: Will New START Extension Pave the Path to Disarmament?"

[65] "India accidentally fires missile into Pakistan," BBC, March 11, 2022, https://www.bbc.com/news/world-asia-india-60711653, accessed on October 17, 2024.

[66] Pakistan's air force said the missile traveled at Mach 3 - three times the speed of sound - at an altitude of 12,000m (40,000ft) and flew 124km (77 miles) in Pakistani airspace before crashing. Zafar Nawaz Jaspal, "Managing Escalation: Upgrading CBMs," Policy Brief, Jinnah Institute, Islamabad, 2025, https://jinnah-institute.org/publication/managing-escalations- upgrading-cbms/

[67] Quoted in Moeed W. Yusuf, "Brokered Bargaining in Nuclear South Asia: U.S. Mediation in the India-Pakistan Pahalgam Crisis." See also Anwar Iqbal, "Trump Says US Stopped Pak-India 'Nuclear War,'" Dawn, May 13, 2025.

Pakistan and embolden India has helped prevent immediate crisis escalation, it has left Prime Minister Modi in a commitment trap. The Indian government's populist politics risks losing face if it is seen as unable to act against Pakistan, despite creating an aura of invincibility vis-à-vis the neighbour in recent times. India needs a face saver to create a narrative of victory."[68] How will the U.S. or third-party intervention be effective in de-escalating a future conflict between nuclear-armed India and Pakistan? India's dismissal of the U.S. or a third-party role in a future crisis would leave New Delhi and Islamabad to themselves to pull back from the brink. The de-escalation and termination of the crisis will be too difficult, if not impossible because the "two countries do not have meaningful arms control treaties or escalation control protocols and have failed to use their communication hotlines dependably in past crises."[69] Hence, India and Pakistan remain on the threshold of nuclear war in the fourth nuclear age.

Putin's Nuclear Saber-Rattling

Russia's invasion of Ukraine has triggered one of the deadliest asymmetrical warfare in Europe since World War II. It has immensely influenced the Europeans' strategic thinking and inclination towards nuclear weapons. Since the beginning of the Russian-Ukrainian war, President Putin has backstopped his conventional aggression with nuclear threats. He repeatedly signalled that the Kremlin could use nuclear weapons in response to a conventional attack posing a "critical threat to our sovereignty." President Putin's nuclear saber-rattling was taken seriously by the United States. On October 6, 2022, U.S. President Joe Biden warned of "the prospect of Armageddon." He said, "We have not faced the prospect of Armageddon since Kennedy and the Cuban Missile Crisis. . . . He's not joking when he talks about the potential use of tactical nuclear weapons, or biological or chemical weapons, because his military is, you might say, significantly underperforming."[70] The situation has worsened, nuclear rhetoric has become more threatening, and the Kremlin has become more brazenly confrontational. No longer is the threat posed by nuclear weapons contained by mutually agreed rules and accepted norms. "Russia and the United States no longer exchange New START data twice a year, nor do they exchange notifications about the movements of their strategic nuclear forces on a nearly daily basis. Similarly, the treaty-mandated short-notice, on-site inspections are on pause, depriving both sides of valuable and stabilising insights into each other's nuclear forces."[71]

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[68] Moeed W. Yusuf, "Has the U.S. Prevented Another India-Pakistan War?" Belfer Center for Science and International Affairs, May 5, 2025, https://www.belfercenter.org/research-analysis/has-us-prevented-another-india-pakistan-war.

[69] Moeed W. Yusuf, "Brokered Bargaining in Nuclear South Asia: U.S. Mediation in the India-Pakistan Pahalgam Crisis."

[70] Heather Williams, Kelsey Hartigan, Lachlan MacKenzie & Reja Younis, "Deter and Divide: Russia's Nuclear Rhetoric & Escalation Risks in Ukraine," CSIS Project on Nuclear Issues, December 4, 2023, https://features.csis.org/deter-and-divide-russia-nuclear-rhetoric/.

[71] Rose Gottemoeller, "Getting the Most Out of New START Before It Expires."

On February 5, 2026, the New START will expire.[72] President Trump often expressed his desire for "denuclearisation" negotiations with Russia and China because of the high costs and devastating effects of nuclear weapons. Instead of denuclearisation, he issued nuclear threats, announced costly plans to modernise and upgrade the U.S. arsenal, suggested resuming nuclear explosive testing, and announced plans for a national missile defence. Conversely, Russia is upgrading its nuclear arsenal and is conducting nuclear drills. It conducted a new nuclear-powered cruise missile test named Burevestnik on October 21, 2025. Subsequently, it conducted a nuclear readiness tri-forces drill on October 22, 2025. Another powerful weapon development was the Kremlin's new nuclear-powered autonomous super torpedo, named Poseidon, which was tested on October 28, 2025. It is capable of devastating coastal regions by triggering vast radioactive ocean swells. Precisely, the tests of Burevestnik and Poseidon clearly indicate that Russia is developing a striking capability that can evade the Trump administration's $175 billion "golden dome" missile defence system.

Realising that Ukraine may receive longer-range weapons from NATO to strike the Russian cities, the Kremlin revised its nuclear doctrine in 2024. The revised doctrine clearly stated that any nation's conventional attack on Russia that is supported by a nuclear power will be considered a joint attack on it. Putin said, "Conditions for Russia's move to use nuclear weapons are clearly stated. The conditions are the massive launch of air and space attack assets, such as strategic and tactical aircraft, cruise missiles, drones, hypersonic, and other flying vehicles, against Russian territory or its ally,

[72] The 2010 New Strategic Arms Reduction Treaty (New START) restricted Russia and the U.S. to no more than 1,550 deployed warheads on no more than 700 deployed long-range missiles and bombers.

Belarus."[73] On December 18, 2025, Russia had deployed its latest nuclear-capable Oreshnik, an intermediate-range ballistic missile system, in Belarus.[74] The Kremlin had already deployed tactical nuclear weapons in Belarus. These nuclear weapons deployments are in full accordance with the Kremlin's nuclear employment policy. Russia's Former President Dmitry Medvedev warned that a "defeat of a nuclear power in a conventional war may trigger a nuclear war," adding that "nuclear powers have never lost major conflicts on which their fate depends."[75] Putin's nuclear sabre-rattling and the demise of bilateral arms control arrangements between Russia and the U.S. brought nuclear weapons to the centre of the security discourse in Europe. Lithuanian defence minister Dovile Sakaliene commented on the violation of the 1994 Budapest Memorandum, "The message that this sends to other countries is: if you have weapons, don't abandon them, if you have the ability to produce weapons, produce them. Weapons of all kinds. . . . Countries that do have a nuclear weapon, somehow they do not get attacked fiercely."[76]

U.S. Attack on Iran

The landmark feature of the Fourth Nuclear Age is that the U.S. attacked another country's civilian nuclear facilities for the first time, which were under the IAEA safeguards. On June 21, 2025, the U.S. launched an operation—codenamed Midnight Hammer—that involved 125 US military aircraft, including seven B-2 stealth bombers and two dozen Tomahawk cruise missiles, targeting three Iranian nuclear facilities: Fordo, Natanz, and Isfahan. This attack was the first time that the U.S. used its 14 largest bunker-busting bomb, the GBU-57 Massive Ordinance Penetrator (MOP), in an operational conflict. Israel's and the U.S. aggression against Iran in June 2025 has exposed the limits of the invaders to alter Tehran's nuclear policy. The military aggression has strengthened the Iranians' resolve to acquire nuclear weapons. Moreover, Tehran's cooperation with the International Atomic Energy Agency as a party to the NPT has further derailed.

On September 23, 2025, Iran's Supreme Leader Ayatollah Ali Khamenei said, "The American side has been adamant that Iran must not have (uranium) enrichment. We did not surrender, and we will not. We did not and will not yield to pressure in this matter or any other matter."[77] He categorically stated that Iran would not give in to pressure to abandon its enrichment of uranium. Tehran announced the termination of the Joint Comprehensive Plan of Action (JCPOA) on October 18, 2025. Iran's foreign

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[73] "Putin lowers threshold of nuclear response as he issues new warnings to the West over Ukraine," The Associated Press, September 26, 2024. https://apnews.com/article/russia-nuclear-doctrine-putin-aggressor-fd2f2664c2589cdadfe84bd0bdb7275e

[74] "Belarusian leader says Russia deployed its latest nuclear-capable Oreshnik missile to the country," The Associated Press, December 18, 2025,

[75] Guy Faulconbridge and Felix Light, "Putin ally warns NATO of nuclear war if Russia is defeated in Ukraine," Reuters, January 19, 2023, https://www.reuters.com/world/europe/putin-ally-medvedev-warns-nuclear-war-if-russia-defeated-ukraine-2023-01-19/

[76] Quoted in Gideon Rose, "The Third Nuclear Age: Trump, the Order, and the Bomb," Great Decisions, 2026, p. 47.

[77] "Khamenei Says Iran 'Won't Yield' To Pressure To Abandon Uranium Enrichment," Barron's September 23, 2025, September 23, 2025

ministry declared, "As of now, all provisions of the 2015 deal, including the restrictions on the Iranian nuclear programme and the related mechanisms, are considered terminated." The JCPOA was signed by the United States, Iran, the United Kingdom, France, Russia, China, and Germany in 2015 to prevent Tehran from acquiring weapons-grade fissile material capability. The JCPOA was an appropriate arrangement to keep Iran within the NPT framework and prevent it from accumulating weapon-grade fissile material clandestinely. It resulted in the dismantling of two-thirds of Iran's nearly 20000 uranium centrifuges, its entire plutonium facility, and the relinquishment of about 97 per cent of its almost eight tons of low-enriched uranium stockpile. In addition, the IAEA inspectors received unprecedented powers to monitor Iran's nuclear facilities in perpetuity. Trump, Defence Secretary Pete Hegseth, and Director of National Intelligence Tulsi Gabbard announced that Iran's nuclear program was "obliterated." In reality, the Iranian nuclear potential has remained intact. The IAEA claimed that Iran retains most of its high-grade enriched uranium stockpile. It was reported that Tehran has been working on another underground tunnel that could hold more centrifuges. The collapse of the JCPOA and Tehran's continued work on nuclear modernisation could potentially trigger a regional nuclear proliferation crisis in the fourth nuclear age.

Nukes Modernisation & Missile Shield

The nuclear weapons have made their way back to the centre of the strategic agenda of the great powers in the fourth nuclear age. Strategic thinkers and policymakers alike are advocating for modernising nuclear arsenals. Mohamed ElBaradei pointed out, "The nuclear-weapon states possess more than 12,000 nuclear warheads. Some 4,000 are deployed on missiles and aircraft, with around 2,000 on high alert and ready to launch within a few minutes. Worse, all nine nuclear-weapon states are doubling down by "modernising" their arsenals to take advantage of emerging technologies."[78] The U.S. Sentinel program is scheduled to build more than 650 new missiles and more than 400 new silos, costing more than $140 billion.[79] Artificial intelligence and other emerging technologies are becoming entangled with the command and control of nuclear weapons. "China, Russia, and the United States continue to actively engage in weapons-related experiments at their former nuclear testing sites. They also maintain respective "test readiness" programs to enable them to resume full-scale nuclear explosive testing."[80] Precisely, now the nuclear arsenals are advancing, and the weapons are becoming more lethal and more diverse.

Since the demise of the 1972 ABM Treaty in June 2002, the U.S. has invested billions of dollars in the research and development of missile defence systems. On January 27, 2025, President Trump issued an executive order entitled "The Iron Dome for America"—later renamed "Golden Dome" — to the

[78] Mohamed ElBaradei, "A New Age of Nuclear Proliferation?"

[79] Davis Winkie, "US nuke silos get $140 billion upgrade. Are they a liability or asset?" USA TODAY, January 06, 2026,

[80] "From 1945 to 2017, the world's nine nuclear-armed states conducted more than 2,000 nuclear detonations, including more than 500 in the atmosphere, which spread deadly radioactive fallout downwind and across the globe." Daryl G. Kimball, "Trump's Nuclear Test Rhetoric and Reality," Arms Control Today, December 2025.

Defence Department, directing it to develop proposals for a comprehensive anti-missile and air defence system for the United States. Golden Dome is "an architecture for the state-of-the-art system that will deploy next-generation technologies across the land, sea, and space, including space-based sensors and interceptors."[81] He said, "The Iron Dome will further the goals of peace through strength. By empowering the United States with a second-strike capability, the Iron Dome will deter adversaries from attacks on the homeland."

Technologically, the Iron Dome is effective against relatively small, slow weapons, not incoming hypersonic cruise missiles or ICBMs. Still, Trump's order appears to use Iron Dome as branding for a different kind of system entirely—one that, among other things, puts interceptor weapons in orbit. In March 2018, the first Trump administration floated the concept of space weapons/interceptors. It will be a next-generation U.S. missile defence shield against ballistic, hypersonic, and cruise missiles, as well as other aerial threats. Russia has expressed serious reservations about President Trump's decision to build a new missile defence shield, which has the potential to destabilise the global strategic equilibrium among the great powers and increase the probability of military confrontation in space. Russian Foreign Ministry spokeswoman Maria Zakharova's statement on January 31, 2025, highlighted this concern, stating, "It (the plan) directly envisages a significant strengthening of the American nuclear arsenal and means for conducting combat operations in space, including the development and deployment of space-based interception systems."[82] The U.S. weaponisation of space could turn it into an arena of armed confrontation, and the development of an advanced Iron Dome could instigate Russia to expand and upgrade its nuclear arsenal.

The Trump administration's obsession with missile defence systems has prompted other powers, including China, to develop missile shields. On September 3, 2025, China unveiled new strategic missile defence capabilities at the China Victory Day Parade, which could exacerbate the arms race between the United States and China. The new HQ-29 ballistic missile defence system is an operational midcourse interception capability designed to intercept long-range ballistic missiles in the midcourse phase. Thus, "Beijing seeks a comprehensive, multi-layered strategic missile defence capable of defending against long-range threats from the US conventional and nuclear arsenal."[83] The Golden Dome and HQ-29 increase the confidence of the other ballistic missile defence (BMD) systems aspirants, including India. Since the mid-1980s, India's Defence Research and Development Organisation has been developing BMD systems. India's BMD program aims to produce two-tiered missile defensive systems comprising Prithvi Air Defence (PAD) and Advanced Air Defence (AAD) systems. The PAD provides long-range, high-altitude ballistic missile interception during the midcourse phase, and the AAD provides short-range, low-altitude defence against missiles in the terminal phase of their trajectories. Despite decades of investment and scientists' claims, India's BMD

[81] Pranay Vaddi, John K. Warden, "Golden Dome and arms control: impediment or opportunity?" Bulletin of the Atomic Scientists, July 15, 2025.

[82] Alex Richter, "China's strategic missile defense exacerbates arms race instability," The Bulletin of the Atomic Scientists, December 18, 2025, https://thebulletin.org/2025/12/chinas-strategic-missile-defense-exacerbates-arms-race-instability/

[83] In 2024, China revealed the HQ-19 system, intended to rival the US Terminal High Altitude Area Defense (THAAD) platform. Alex Richter, "China's strategic missile defense exacerbates arms race instability."

system is at least a decade away from operational maturity and fielding. Whether these weapons are operationally reliable or not, Pakistani defence policymakers cannot ignore the steady development of India's BMD systems. They are compelled to improve the country's offensive missile arsenal qualitatively and quantitatively so that its cruise and ballistic missile inventories overwhelm the adversary's missile shield numerically and qualitatively. Besides, they may develop BMD systems.

The investment in the missile shield obviously fast-track military modernisation and further shrink the space for arms control. It strengthens the justification for states to field novel delivery systems to overcome adversaries' strategic missile defences by integrating emerging technologies. The assumption that the BMD system would strengthen deterrence is debatable. "Deterrence relies on the concept of mutual vulnerability, a balance of terror. That means investments in defence will prompt an adversary to invest in more offence—in short, an arms race."[84] Hypothetically speaking, ballistic missiles or hypersonic glide vehicles with lower flight paths could reduce the time payloads spend in the midcourse phase and therefore decrease the opportunity for interception. Deploying more decoys and reintroducing multiple independent re-entry vehicles for ICBMs could increase the number of targets the defensive system has to intercept in the midcourse phase. Besides, it hastens the process of space weaponisation. The Trump administration announced "Ensuring American Space Superiority." The Space Force defines space superiority as follows: "A degree of that allows military forces in all domains to operate at a time and place of their choosing without prohibitive interference from space or counterspace threats, while also denying the same to an adversary."[85] The fourth nuclear age will experience the devastating modernisation of nukes due to the race between offensive and defensive missiles, and space will emerge as a new combat zone. Moreover, it will experience the offence-defence missile dynamic, which necessitates recalibrating nuclear strategy. This differs from traditional nuclear strategy: you chalk out a nuclear strategy to fight a war, but it was designed to avoid one. The modern nuclear strategy could be to decapitate the adversary's nuclear weapons with preemptive strikes and cyber-attacks while sheltering under the missile shield.

NNPR Ineffectuality

The fourth nuclear age alarming feature is ineffectuality of the twentieth-century nuclear non-proliferation regime (NNPR),[86] an increasing number of nuclear-armed states, fabrication and integration of emerging destructive technologies to advance the lethality of the nukes, recalibration of nuclear doctrines influenced by a multipolar strategic environment, discredit of nuclear taboo, and amplifying nuclear risks due to accidents and inadvertent use of nuclear weapons. The new round of

[84] Alexandra Bell, "A National Security Strategy with no strategy for managing existential risks," Bulletin of the Atomic Scientists, December 8, 2025.
[85] Theresa Hitchens, "New Trump space policy sets 2028 deadline for Moon base, Golden Dome prototype," Breaking Defense, December 19, 2025.
[86] The NNPR is shaped by a vast ecosystem of treaties, multilateral regimes, sanctions laws, export controls, and other tools to dissuade and prevent more states from crossing the nuclear weapons threshold.

nuclear proliferation stems from stalled arms-control talks, and most agreements have expired or been hollowed out to the point that they have lost all credibility. The four multilateral export control arrangements—the Nuclear Suppliers Group, the Wassenaar Arrangement, the Australia Group, and the Missile Technology Control Regime—are becoming ineffective because emerging technologies are not addressed, and capable states that remain outside their exclusive membership are not engaged. Secondly, the allies and partners' trust in the U.S. extended deterrence is diminishing. American analysts opined, "Apart from Iran, the most plausible states that might seek the bomb in the near future are U.S. allies or security partners, which makes the potential tradeoffs between nonproliferation and alliance management more acute. At the same time, many of the existing tools and approaches to prevent proliferation are losing potency. In the aggregate, these changes mean the system in place to limit the spread of nuclear weapons is eroding."[87] Thirdly, in the past, states considering the potential acquisition of nuclear weapons would do so in secret. Currently, the leaders in countries like Poland, Saudi Arabia, South Korea, Turkey, and even Japan openly discuss and debate the value of a national nuclear deterrent.[88]

President Trump pledged support for South Korea to enrich uranium and separate plutonium, which enables Seoul to produce fissile material for nuclear weapons, and also its plan to build nuclear-powered attack submarines.[89] Trump's support for fissile material strengthens the lobby in South Korea that is convinced that Seoul needs to pursue nuclear weapons to deter North Korea.[90] In addition, the Trump administration is distancing itself from American allies and partners, compelling them to adopt a look-within, self-help defence policy. The casualty of their drive for indigenous nuclear weapons due to mistrust of the U.S. extended nuclear deterrence will be the twentieth-century nonproliferation regime that "keeps mass acquisition of nuclear weapons at bay, a voluntary act of concerted national self-restriction, one that countries adhere to because they feel safer with the regime than they would without it."[91] This could lead to a significant shift in global nuclear stability because of vertical and horizontal proliferation, potentially increasing the risk of nuclear conflict.

President Trump has repeatedly called for renewed U.S. nuclear weapon testing because he lost confidence in a Stockpile Stewardship Management Program established by the U.S. Department of Energy in 1994, to examine concerns about the age degradation of its weapons. Siegfried Hecker argued, "With the stockpile stewardship program, the United States has greatly increased its knowledge, leading to an improved understanding but not necessarily improved confidence."[92] Trump claimed—incorrectly—that the U.S. will resume testing due to China, Russia, North Korea, and Pakistan's clandestine nuclear tests. He seems interested in advancing his country's nuclear arsenal as

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[87] "Preventing an Era of Nuclear Anarchy: Nuclear Proliferation and American," p. 10.

[88] Alexandra Bell, "Eighty years and 89 seconds: It's time to fight against midnight," The Bulletin of the Atomic Scientists, December 10, 2025

[89] Kelsey Davenport, "U.S. Supports South Korean Enrichment, Reprocessing," Arms Control Today, December 2025.

[90] South Korea developed ballistic missiles powerful enough to deliver a nuclear warhead and built an advanced nuclear industry that it could leverage if the decision were made to develop nuclear weapons.

[91] Gideon Rose, "The Third Nuclear Age: Trump, the Order, and the Bomb," Great Decisions, 2026, p. 40.

[92] Siegfried Hecker, "Lessons From Los Alamos: America Has the Most To Lose From Restarting Nuclear Testing," Foreign Affairs, November 26, 2025. https://www.foreignaffairs.com/united-states/lessons-alamos.

part of Washington's drive for significant changes in its military. Jeffrey Lewis wrote in July 2024 that people close to President Trump, including those who could serve in a second administration of his, are once again floating the unhelpful idea of the United States resuming nuclear weapons testing. Therefore, resuming nuclear testing was on his agenda during the 2024 Presidential elections.[93] Vice President JD Vance and some Republicans in Congress endorsed Trump's determination to resume nuclear testing.

On October 31, 2025, the U.S. cast a "no" vote on an annual UN First Committee resolution in support of the global moratorium on nuclear testing and the CTBT. "Trump's nuclear testing rhetoric is confusing, counterproductive, and dangerous. The United States has no technical, military, or political reason to resume nuclear explosive testing for the first time in 33 years. No other country is conducting nuclear explosive tests, which the nuclear-weapon states define as nuclear explosions that produce a self-sustaining, supercritical chain reaction of any kind."[94] Nuclear testing certainly fueled the arms race and the development and deployment of new and more deadly types of nuclear weapons. Therefore, American analysts are warning Trump that "a return to testing at this time would likely benefit U.S. adversaries more than it would the United States. Worse still, it might rekindle an even greater and broader arms race than in the first few decades of the Cold."[95] So, the fourth nuclear age is moving from the no-test to the testing era, with an enormous spiralling into a nuclear arms race.

Is Extended Deterrence a Sham?

The United States' allies, except France,[96] have trusted its nuclear umbrella and refrained from developing an indigenous nuclear deterrent capability despite having technological know-how and material availability during the first, second, and third nuclear ages. Over the past 60 years, "the U.S. provision of contingent security benefits to allies and partners has been an essential means of reducing potential demand for the bomb. The United States extends' deterrence, backstopped by its own nuclear arsenal, to bolster the security of allies and dampen their interest in indigenous nuclear weapons capabilities."[97] The rapid transformation in global politics, Trump's America First policy, and the way the U.S. deals with allies and partners have created doubts among some U.S. allies about the reliability of the US nuclear umbrella in the fourth nuclear age. "Donald Trump's return to the presidency is accelerating the fragmentation, as allies and partners question the credibility of U.S. security commitments and Washington contemplates whether it will continue to lead on nonproliferation globally."[98] There is an intensifying debate in France, Germany, Poland, the United Kingdom, Japan, and South Korea about how to defend themselves in an evolving, competitive, and

[93] Jeffrey Lewis, "Why America Stands to Lose If It Resumes Nuclear Testing: China and Russia Would Finally Be Able to Catch Up," Foreign Affairs, July 30, 2024.
[94] Daryl G. Kimball, "Trump's Nuclear Test Rhetoric and Reality."
[95] Siegfried Hecker, "Lessons From Los Alamos: America Has the Most To Lose From Restarting Nuclear Testing."
[96] France successfully tested its first weapon in 1960, even though it was already under the American nuclear umbrella.
[97] "Preventing an Era of Nuclear Anarchy: Nuclear Proliferation and American," p. 14.
[98] Rebecca Lissner, "The Pillars of the Global Nuclear Order Are Cracking," Foreign Policy, January 05, 2025.

dangerous strategic environment. The fear that Trump could withdraw U.S. military protection of the continent has forced Europeans to confront a stark reality: they must adopt a consensual approach to Europe's security. The deteriorating security environment and heightened threat perception have led to the announcement of a 'Coalition of Willing' in February 2025.[99] British Prime Minister Starmer announced that the U.K. will increase its defence spending to 2.5 per cent of its GDP by 2027, with a long-term goal of reaching 3 per cent. Germany signalled its intent to increase its defence budget to $107 billion a year. French President Emmanuel Macron signalled his willingness to extend his country's nuclear deterrent to other European nations. These were clear indications that the Europeans realised they must be capable and prepared to take the continent's defence into their own hands. Whether Europeans like or disapprove, they must learn to live without U.S. security patronage in the rapidly transforming global strategic environment.

Since the first nuclear age, Germany has possessed the scientific and technical capability to produce nuclear weapons, but it refrained from developing an indigenous nuclear deterrence capability. Before the start of the Ukraine war on February 24, 2022, many Germans opposed hosting U.S. nuclear weapons on their territory and were in favour of signing the nuclear ban treaty. Berlin seems to be revising its disarmament, arms control, and nuclear non-proliferation approaches in the fourth nuclear age, as they no longer suit today's geostrategic environment. The protracted Ukrainian war and President Trump's approach to European security arrangements are transforming Berlin's strategic thinking.

What is intriguing about the fourth nuclear age is that the European nations that were once concerned about German reunification creating an over-powerful German state are now advocating for Berlin to expand its military power to defend Europe against Russia. This shift in attitude is a direct result of the Trump administration's intention to disengage from European defence. The German Army deployed 45 Armoured Brigade, a German combat brigade, in Vilnius on May 22, 2025. The German defence minister, Boris Pistorius, confirmed Germany's interest in purchasing the mobile Typhon missile launch system, capable of firing both short-range ballistic and medium-range cruise missiles, in July 2025.[100] The deployment and purchase of medium-range missile systems with a range of up to 2,000 kilometres are perhaps the earliest visible manifestation of 'Zeitenwende'[101] – loosely translated as 'turning point—the security policy shift announced by German Chancellor Olaf Scholz on February 27, 2022, immediately after the Russian invasion of Ukraine in 2022.[102]

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[99] Niklas Ebert and Claudia Major, ed. "Coalition of the Willing," Report, GMF, May 2025, https://www.gmfus.org/sites/default/files/2025-05/Coalition%20of%20the%20Willing.pdf

[100] Tom Kühnel & John Hardie, "Germany considers buying US-made Typhon as 'bridge' long-range strike solution, Long War Journal, July 25, 2025, https://www.longwarjournal.org/archives/2025/07/germany-considers-buying-us-made-typhon-as-bridge-long-range-strike-solution.php

[101] The 'Zeitenwende' marks a profound cultural and political shift for a nation that was once rebuilt on a pacifist, demilitarized legacy after World War II.

[102] Bilal Mahli, "Zeitenwende: Germany's Strategic Shift in Foreign and Security Policy," Policy Paper, September 13, 2024, https://www.policycenter.ma/sites/default/files/2024-09/PP_defence12-24_Bilal%20Mahli%20.pdf

The new government, constituted in May 2025, endorsed former Chancellor Olaf Scholz's initiatives to modernise the German armed forces. The continuity of military upgradation testifies that the country's military rejuvenation is permanent and lasting. Consequently, there is a higher investment in domestic defence equipment production, a planned €108.2bn defence budget for 2026, and in the construction of new military bases.[103] Moreover, Germany has invested in developing the Main Ground Combat System (MGCS), the Next Generation Weapon System, and Deep Precision Strike capabilities to ensure these armaments are available to the armed forces by 2040.[104] German leadership realises the significance of the extended nuclear deterrence ensured by a nuclear-weapon state. Being a non-nuclear-weapon state, it has initiated a strategic dialogue process with France and the U.K. for the sake of nuclear deterrence. German Chancellor Friedrich Merz has been discussing a European nuclear umbrella with the United Kingdom and France. The U.K. and France are incapable of extending their nuclear deterrence to other European countries, including Germany. For instance, with its 280 nuclear warheads, France is unable to provide credible nuclear deterrence to other European countries. Merz endeavours for a European-led nuclear policy in the emerging era of nuclear politics, which could end Berlin's nuclear non-proliferation policy. Thus, for credible nuclear deterrence, sooner or later, Germany can develop its indigenous nuclear weapons.

Japan is a member of the NPT and maintains that it does not possess or produce nuclear weapons. However, it has developed an advanced civilian nuclear energy program, large stockpiles of separated plutonium, and an impressive local defence industry. Hence, capable of acquiring nuclear weapons within months. Presently, Tokyo is worried due to the expansion of China's nuclear arsenal. On December 18, 2025, a member of Japan's prime minister's office who advises Prime Minister Sanae Takaichi on national security said, "I think we should possess nuclear weapons." She added, "In the end, we can only rely on ourselves."[105] Priemer Takaichi is considering reviewing the Three Non-Nuclear Principles, which prohibit possessing, producing, or permitting the introduction of nuclear arms. On November 10, 2025, she hinted in parliament about the possibility of altering those three principles in an upcoming revision of Japan's security strategy.[106] She believed that the non-introduction principle is not realistic. Therefore, the U.S. should be allowed to bring nuclear weapons into Japan, on submarines or other platforms, to strengthen deterrence. Even a minor shift in the nuclear policy ends Japan's moral opposition to the nukes and strengthens the nuclear optimist (though ineligible today) perception in the country. Indeed, it is apparent that there is distrust of the contemporary international nuclear order.

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[103] Dr Marion Messmer, "Will Germany rearm quickly enough?" Chatham House, October 3, 2025, https://www.chathamhouse.org/2025/08/will-germany-rearm-quickly-enough

[104] "MGCS Project Company GMBH established in Cologne," Press Release, April 17, 2025, https://knds.com/en/press-releases/MGCS-project-company-gmbh-established-in-cologne

[105] "Japan needs to possess nuclear weapons, prime minister's office source says," Kyodo News, December 18, 2025, https://english.kyodonews.net/articles/-/67089

[106] Tim Kelly and John Geddie, "Japan PM wavers on nuclear arms question in sign of possible shift," Reuters, November 12, 2025, https://www.reuters.com/world/china/japan-pm-wavers-nuclear-arms-question-sign-possible-shift-2025-11-12/

South Korea, despite having full fuel-cycle capability, has refrained from developing indigenous nuclear deterrence to date. Like neighbouring Japan, South Korea is protected under Washington's so-called nuclear umbrella. This term refers to the protection that the U.S. provides to its allies by promising to use its nuclear weapons to defend them in case of a nuclear attack. Seoul and Washington signed a deal in October 2025 to build and deploy a nuclear-powered submarine, enhancing the South Korean navy's capabilities. The justification for nuclear-powered submarines without nuclear missiles is that these weapon platforms provide greater underwater endurance and stealth potential. For three decades, Seoul had strived for nuclear submarines. In 2017, Moon Jae-in campaigned on South Korea acquiring nuclear-powered submarines.[107] The Trump administration believes that the nuclear submarine cooperation may weaken South Korea's appetite for developing its own nuclear arsenal. A similar agreement, AUKUS, was made between the United Kingdom, the U.S., and Australia in 2021. Under the deal, Australia will build nuclear-powered submarines using UK reactors and US highly enriched uranium fuel, at a cost of up to $368 billion.[108] Similar deals with Japan and Vietnam could follow to increase their confidence in the extended deterrence.

The difference between the two categories of submarines is that nuclear-powered submarines use nuclear propulsion, whereas nuclear-armed submarines carry nuclear weapons. It is debatable whether it's a rational decision to develop a nuclear submarine by a non-nuclear-weapon state due to its cost.[109] In the Korean peninsula, without nuclear weapons, South Korean nuclear-powered submarines could not balance or deter a North Korean nuclear-armed Navy. Analyst opined, "In South Korea's case, however, there is little military rationale for nuclear-powered submarines, and pursuing them may not be worth the political or financial costs. And in any case, international agreements may prevent South Korea from acquiring the fuel necessary to power them, either through direct purchase or through an indigenous enrichment capacity."[110] Therefore, the overwhelming majority of South Koreans have expressed their desire to develop the country's own nuclear capability in various polls. The transformation of nuclear politics because of the resumption of testing by nuclear-armed states and mistrust of the U.S. nuclear umbrella further strengthens the demand for nuclear weapons in South Korea.

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[107] Sharon Squassoni, "How nuclear submarines could pave the way for nuclear weapons in South Korea," Bulletin of the Atomic Scientists, December 12, 2025.

[108] Ibid.

[109] Per unit, a single modern diesel-electric attack submarine with air-independent propulsion costs between $500 million and $900 million. A modern nuclear-powered attack submarine will cost between $3 billion and $4 billion each, based on the current cost of Virginia-class nuclear attack submarines in the United States. Only six countries—the United States, Russia, Britain, France, China, and India—have nuclear-powered submarines. These are all nuclear-armed countries. In theory, such submarines can enhance stability because they provide assured destruction in case an opponent seeks advantage by striking first—the so-called delicate balance of terror. It is because nuclear submarines are stealthy, fast, and have unlimited range, making them a platform for assured nuclear retaliation.

[110] Seoc Woo Kim, Jungmin Kang, Frank von Hippel, "South Korea's risky quest to build nuclear-powered attack submarines," Bulletin of the Atomic Scientists, November 18, 2020.

Nuclear Fusion: A New Source of Energy

Increasing electricity demand for economic development and concerns about climate change and air pollution from fossil fuel use are making the nuclear energy industry salient and desirable in the fourth nuclear age. Citing climate and energy security, more countries across Africa, the Middle East, and Southeast Asia are advancing nuclear power programs, gradually increasing nuclear energy's share of their energy mix. On December 12, 2023, the global nuclear industry pledged at the United Nations Climate Summit (COP28) in Dubai to triple nuclear energy by 2050.[111] On March 21, 2024, the IAEA and Belgium organised the first-ever Nuclear Energy Summit in Brussels, which brought together 32 countries and numerous nuclear organisations. The Summit was a remarkable initiative that engaged world leaders in exploring nuclear energy cooperation, reducing the use of fossil fuels, and boosting economic development. Indeed, convening a nuclear energy summit was a practical step to fulfil the commitment made by 25 governments at COP28 to triple their nuclear energy capacity by 2050. In May 2025, President Trump signed four executive orders on nuclear power to accelerate the construction of nuclear power plants in the U.S. and support new, smaller, and less-regulated reactor designs.[112] These executive orders boost research and development of new reactors and strengthen efforts to promote nuclear energy.

In the fourth nuclear age, the distinctive development could be the utilisation of nuclear fusion, a new carbon-free energy source. The U.S. climate envoy, John Kerry, said on December 5, 2023, that the U.S. would work with other governments to accelerate efforts to make nuclear fusion a new carbon-free energy source. The benefits of fusion energy are colossal: it produces 4 million times more energy than fossil fuels without releasing harmful gases. Scientists opine that "nuclear fusion melds two hydrogen atoms together to produce a helium atom and a lot of energy."[113] It would be a clean energy source to power cars, heat/cool homes, and other things instead of fossil fuels. It means no CO2or other harmful atmospheric emissions from the fusion process. Moreover, the process produces very little waste that is much less radioactive than that from a conventional nuclear power plant. Hence, the fusion does not contribute to greenhouse gas emissions or global warming.

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[111] Dr. Zafar Nawaz Jaspal, "Pakistan needs to reap the dividends of nuclear energy," Arab News, December 13, 2023, https://arab.news/ghqgd.

[112] François Diaz-Maurin, "The 2025 nuclear year in review: Back to the Future Atomic Age," Bulletin of the Atomic Scientists, December 25, 2025.

[113] Jennifer McDermott, "At COP28, John Kerry unveils nuclear fusion strategy as a source of clean energy," The Seattle Times, December 5, 2023, https://www.seattletimes.com/business/us-unveils-global-strategy-to-commercialize-fusion-as-source-of-clean-energy-during-cop28/]

The increase in nuclear energy use may effectively cut carbon emissions to near zero in the coming decades. However, nuclear energy poses serious risks, including the potential for proliferation if export controls, physical protection, and interagency coordination are underdeveloped,[114] nuclear and radiological terrorism, and nuclear power plant accidents. The advocates of fusion technology opine that fusion reactors will not melt down like the 1986 Chornobyl nuclear power plant disaster and the 2011 Fukushima Daiichi four-reactor disaster. The fusion reactor operates differently from a fission reactor, and there's no risk of meltdowns like those at Chornobyl and Fukushima. Hence, fusion reactors are considered inherently safe against sabotage and accidents. However, a fusion reactor prototype is expected to be built by 2040. Besides, the foolproof apparatus to prevent the use of civilian nuclear fusion technology and materials for the manufacture of fusion weapons is missing.

[114] Zahir Kazmi, "Strengthening UNSCR 1540: Pathways for Nonproliferation and Balanced Development," Arms Control Today, December 2025.

Conclusion

The resurgence of nuclear weapons and missile defence systems in international statecraft, reminiscent of the Cold War era, is a pressing concern in the fourth nuclear age. With Russia's nuclear threats, the U.S. Golden Dome initiative, China and North Korea's expanding arsenals, and potential proliferation in the Middle East, Europe, and East Asia, and the probability of the escalation of conventional war to nuclear exchanges between India and Pakistan, the world is thrust into a new era of heightened nuclear risk. These trends, coupled with the emergence of disruptive technologies, the demise of bilateral arms control between Russia and the U.S., and the steady deterioration of NNPR, create a more ambiguous, complex, and volatile international security environment. More states now possess devastating capabilities, increasing the risk of nuclear conflict, particularly in South Asia and Europe, where the danger is most imminent.

The politics and debates of nuclear weapons and nuclear energy will continue in the fourth nuclear age around the world. The trends in global geopolitics indicate that more states will acquire, or at least pursue, nuclear weapons. It features more nuclear weapons, more nuclear-armed states, no limits on their arsenals, and speculations about the use of nuclear weapons in war. Consequently, the fourth nuclear age is potentially more dangerous than its predecessors because of a conventional armed conflict between nuclear-armed states, the absence of agreements that facilitate cooperation and offer a level of security in the previous ages, the fabrication and integration of new technologies in nuclear weaponry, and new doctrines that provide nuclear weapons with a non-deterrent role. The statements that a nuclear war cannot be won and must never be fought begin to look hollow. The world is heading dangerously close to the nuclear precipice. Thus, nuclear instability and the risk of nuclear war due to the dynamic spiralling nuclear arms race are alarming in the fourth nuclear age.

Bio

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