The Hypersonic Missile Race: An Analysis of Global Dynamics and South Asian Strategic Stability

Ghazala Yasmin Jalil and Muskan Moazzam*

Abstract

Hypersonic weapons represent a new genre of weapons that are significant because of their ability to maneuver once launched, their hypersonic speed, and the capacity to penetrate ballistic missile defense (BMD) systems. The paper examines the implications of the hypersonic missile race in the global and regional context using a realist theoretical framework centered on the security dilemma and arms racing. The main findings suggest that hypersonic weapons are destabilizing because they compress decision windows, complicate deterrence strategies, and escalate the risk of an arms race. However, at the global level, the effectiveness of hypersonic weapons is likely to differ across various actors. At the regional level, hypersonic weapons would be far more destabilizing due to proximity and shorter decision timelines. Furthermore, it would increase the risk of an Indian preemptive strike and foster a false sense of confidence among decision-makers that hypersonic missiles could execute a successful counterforce strike, while existing BMD systems would intercept any Pakistani counterstrike. This dynamic significantly undermines the established deterrence relationship. Furthermore, the deployment of hypersonic weapons would exacerbate the regional security dilemma; as India enhances its strike capabilities, Pakistan would feel compelled to pursue counter-hypersonic technologies and adjust its doctrinal posture to ensure survival, inadvertently heightening suspicion and instability. It concludes that there is a need for mechanisms to counter destabilizing effect of hypersonic weapons at global and regional levels.

Keywords: Hypersonic Missiles, Deterrence, South Asia, Strategic Stability, Ballistic Missile Defence, Arms Race, Security Dilemma.

* Ghazala Yasmin Jalil is a Research Fellow at the Institute of Strategic Studies, Islamabad. She can be reached at ghazala.jalil@issi.org.pk.
Muskan Moazzam is a Research Associate and Sub Editor at the Institute of Strategic Studies, Islamabad. She can be reached at muskanmoazzam@issi.org.pk.

Introduction

The pursuit of hypersonic missiles has become a concern over the past decade or so due to their speed, which exceeds Mach 5 (five times the speed of sound), and their ability to maneuver after launch, making it difficult for existing missile defense systems to target them.[1] The United States, Russia, and China have led early hypersonic weapons development. India has also entered the fray with the development of the High-Speed Technology Demonstrator Vehicle (HSTDV). Other countries pursing hypersonic technologies include France, Japan, South Korea, Turkey, while Australia is collaborating with the US on hypersonic research and development initiatives.[2]

The emergence of a new competition in hypersonic weapons poses intricate problems for international security. The maneuverability and speed of these missiles are unprecedented, reducing the efficacy of existing missile defense and jeopardizing the already delicate balance of deterrence by major states. Russia and China are one such example whose hypersonic projects are considered by them as a means to counter and penetrate the US's missile defense systems. This will, in turn, trigger a chain reaction, as other states may respond by pursing hypersonic and counter-hypersonic missiles, and the arms race will continue to gain momentum. Moreover, many states envision both a conventional and nuclear role for the hypersonic missiles. The inability to distinguish conventional from nuclear payloads in real time increases the risk of catastrophic miscalculation.

The hypersonic missiles also have profound regional implications, particularly in South Asia. The development of this technology by India has become a new variable in the nuclear equation with Pakistan, further destabilizing an already fragile nuclear milieu. Since the existing missile flight time within the region is between 5 and 10 minutes,[3] the hypersonic missile may significantly reduce it, leading to higher risks of inaccuracy and preemptive strikes. This kind of imbalance may confer a perceived advantage for India in the regional deterrence equation, posing a new security dilemma for Pakistan.

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[1] UK Parliament, Parliamentary Office of Science and Technology (POST), "Hypersonic Missiles," POSTnote 696 (June 2023), https://researchbriefings.files.parliament.uk/documents/POST-PN-0696/POST-PN-0696.pdf.

[2] Kelley M. Sayler, "Hypersonic Weapons: Background and Issues for Congress," Congressional Research Service Report R45811, updated August 12, 2025, https://www.congress.gov/crs_external_products/R/PDF/R45811/R45811.53.pdf.

[3] Zia Mian, R. Rajaraman, and M. V. Ramana, "Early Warning in South Asia—Constraints and Implications," *Science & Global Security* 11 (2003): 109–150, https://scienceandglobalsecurity.org/archive/sgs11mian.pdf.

It is imperative to examine implications of hypersonic missiles development. The paper examines their nature, impact on the global and regional deterrence policy, as well as how additional arms races can be introduced. Specifically, the paper examines the implications of hypersonic weapons on strategic stability globally and the potential impact on South Asia's India-Pakistan deterrence equation.

The scholarly debate on hypersonic weapons is primarily divided into two schools of thought regarding global strategic stability. The first group, characterized by Speier et al. Altmann and Reif, argues that the combination of unpredictable flight paths and extreme velocity creates "warhead ambiguity" and "target ambiguity," significantly shortening decision-making timelines and increasing the risk of inadvertent nuclear escalation.[4] Conversely, a second group of scholars, such as Cunningham, suggests that for states like China and Russia, hypersonic glide vehicles (HGVs) may actually be stabilizing by ensuring the penetration of US BMD systems, these weapons restore the "mutual vulnerability" necessary for deterrence, effectively neutralizing the perceived advantage of a first-strike capability protected by an interceptor shield.[5]

However, much of this global literature remains focused on the major power triad US-Russia-China, often treating South Asia as a peripheral concern. Within the regional context, Sultan and Khursheed have begun to map the specific risks to the Indian-Pakistani dyad, focusing on the reduction of flight times to under five minutes and the risk of escalation.[6] Ayesha Abbasi argues that India's pursuit of hypersonic weapons technology is driven primarily by a quest for global prestige.[7] Despite these initial inquiries, a significant gap remains: existing regional studies often focus on technical specifications rather than the Realist security dilemma – specifically, how the perceived efficacy of India's BMD, when coupled with hypersonic offensive capabilities,

[4] R. H. Speier et al., *Hypersonic Missile Nonproliferation: Hindering the Spread of a New Class of Weapons* (Santa Monica, CA: RAND Corporation, 2017), https://www.rand.org/pubs/research_reports/RR2137.html, Kelsey Reif, "Hypersonic Advances Spark Concern," *Arms Control Today*, January/February 2018, https://www.armscontrol.org/act/2018-01/news/hypersonicadvances-spark-concern, Jürgen Altmann, "New Military Technologies: Dangers for International Peace and Security," *Themenschwerpunkt* 38, no. 1 (2020): 36–42.

[5] Alan Cummings, "Hypersonic Weapons: Tactical Uses and Strategic Goals," *War on the Rocks*, November 12, 2019, https://warontherocks.com/2019/11/hypersonic-weapons-tactical-uses-and-strategic-goals/, F. S. Cunningham and M. T. Fravel, "Dangerous Confidence? Chinese Views on Nuclear Escalation," *International Security* 44, no. 2 (2019): 61–109.

[6] Dr. Adil Sultan and Itfa Khursheed, "Hypersonic Weapons in South Asia: Implications for Strategic Stability," *IPRI Journal* 11, no. 1 (2021): 18, https://journal.ipripak.org/wp-content/uploads/2021/07/Article-3-IPRI-Journal-XXI-1.pdf.

[7] Ayesha Abbasi, "Indian Quest for Hypersonic Missiles in South Asia and Disruption of Strategic Stability in the Indo-Pak Dyad," *IPRI Journal* 23, no. 2 (2023): 37.

creates an asymmetric "window of opportunity" that threatens Pakistan's second-strike survivability. This study advances the debate by moving beyond the binary "stabilizing vs. destabilizing" argument. It seeks to contribute to a comparative analysis that juxtaposes the potential of restoring stability at the global level with the existential instability at the regional level.

This study's main question is: How does the international development of hypersonic missile technologies shape deterrence dynamics, and how does it affect deterrence between India and Pakistan? This paper argues that the deterrence effects of hypersonic weapons are context-dependent. While hypersonic development can reinforce deterrence at the global level by improving penetration and survivability, it simultaneously creates new challenges. In South Asia, India's pursuit of hypersonic capabilities risks compressing decision-making timelines and intensifying action–reaction dynamics.

The study employs a qualitative policy analysis to examine implications of hypersonic missiles at the global and regional levels. It draws on a comprehensive review of the literature on hypersonic weapons development worldwide and in South Asia, supported by a mix of primary and secondary sources, including open-source defense data, expert commentary, and strategic assessments. The analysis focuses on action–reaction dynamics and arms racing patterns of security dilemmas.

The paper is organized into three sections. First, it establishes the discussion within a theoretical framework to provide a structural basis for analysis. This is followed by an examination of hypersonic developments among leading powers, the US, China, and Russia, as well as the specific advancements made by India. The analysis then shifts to the global and regional implications of these weapons, focusing on the compression of the OODA loop and concluding with strategic options for Pakistan.

Theoretical Framework

This paper uses the concept of the security dilemma to explain why arms competition often intensifies even in the absence of aggressive intent. As John Herz originally described it, the security dilemma refers to a situation where "the attempt of one state to increase its security leads others to feel less secure," pushing all sides toward greater insecurity.[8] Robert Jervis later captured

[8] John H. Herz, *Political Realism and Political Idealism: A Study in Theories and Realities* (Chicago: University of Chicago Press, 1951).

the same logic by noting that "many of the means by which a state tries to increase its security decrease the security of others."[9] The central assumption behind this framework is that states operate under conditions of uncertainty in an anarchic international system. Because intentions cannot be observed with confidence, even defensive measures are interpreted through worst-case assumptions. When this logic is combined with the arms racing action–reaction model, the result is a self-reinforcing cycle in which each side's efforts to avoid vulnerability make restraint appear increasingly risky.[10]

This dynamic is visible in the international development of hypersonic missile technologies. The pursuit of hypersonic systems by the United States, Russia, and China is driven by concerns about penetrating missile defenses, preserving strategic credibility, and avoiding technological lag, yet these efforts simultaneously heighten mutual threat perceptions. The same logic carries into regional settings.

The deployment of missiles with hypersonic capabilities within the South Asian region introduces a distinct challenge. The already tense nuclear environment between India and Pakistan could be further destabilized by the perceived advantage that hypersonic missiles might offer one side. This could lead to a situation where states, fearing a potential first strike with hypersonic weapons, might be tempted to adopt a more aggressive posture, potentially lowering the threshold for nuclear escalation. In the context of India and Pakistan, the development of hypersonic missiles and the presence of BMD "increases effective resolve of India in a crisis with Pakistan, where it would be willing to take greater risk to prevail in a crisis".[11]

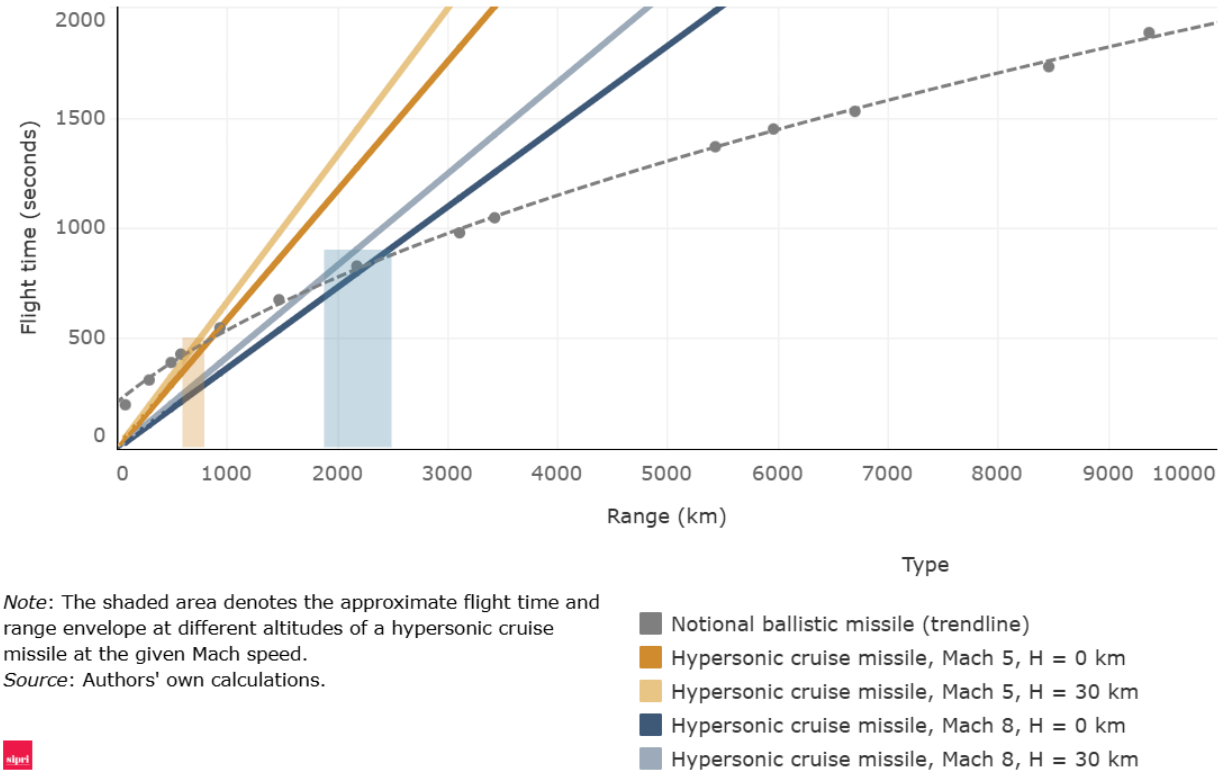
Hypersonic Weapons: Types and Characteristics

Hypersonic weapons are a novel category of weaponry. They are characterized by extremely high speed, which is above Mach 5 or 6,450 km/h. The countries most technologically advanced in missile development, such as Russia, have even reached a speed of Mach 27.[12] Hypersonic-speed

[9] Robert Jervis, "Cooperation Under the Security Dilemma," *World Politics* 30, no. 2 (January 1978): 167–214.
[10] hiping Tang, "The Security Dilemma: A Conceptual Analysis," *Security Studies* 18, no. 3 (2009): 587–623, https://doi.org/10.1080/09636410903133050.
[11] Ghazala Yasmin Jalil, "Indian Missile Defence Development: Implications for Deterrence Stability in South Asia," *Strategic Studies* 35, no. 2 (Summer 2015), http://issi.org.pk/wp-content/uploads/2016/05/Ghazala.35-No.2.pdf.
[12] "Russia Says Its New Weapon Is 27 Times Faster Than the Speed of Sound," *Military Times*, December 27, 2018, https://www.militarytimes.com/news/your-military/2018/12/27/russia-says-its-new-weapon-is-27-times-faster-than-the-speed-of-sound/.

ballistic missiles of the US and Russia are not new. However, compared to the past hypersonic prototypes, these missiles have impressive maneuverability even after launch. For instance, their ability to redirect during flight makes tracking and interception very difficult and renders existing missile defense systems outdated.

There are two types of hypersonic missiles: First, Hypersonic Glide Vehicles (HGVs): The hypersonic glide vehicles are attached to existing intercontinental ballistic missiles (ICBMs) for initial launch. Second, Hypersonic Cruise Missiles (HCMs): they are continuously propelled by rockets or advanced air-breathing engine, allowing them to operate at low altitudes and exhibit high maneuverability, unlike HGVs.



Note: The shaded area denotes the approximate flight time and range envelope at different altitudes of a hypersonic cruise missile at the given Mach speed.
Source: Authors' own calculations.

Fig. 1[13]

[13] Kolja Brockmann and Markus Schiller, "A Matter of Speed? Understanding Hypersonic Missile Systems," February 4, 2022, https://www.sipri.org/commentary/topical-backgrounder/2022/matter-speed-understanding-hypersonic-missile-systems.

The Hypersonic Missile Race: A Global Overview

While the leading players in the development of hypersonic missiles are moving at a fast pace, other countries are also catching up, including Australia and India. This section explores the motivations and programs of key players in this race.

- ***The Development of Hypersonic by the US***

The US initiated hypersonic weapon development under its Conventional Prompt Global Strike (CPGS)[14] program in the 2000s and is investing heavily in research and development efforts spread across the branches of the military. The US primarily envisages a conventional role for hypersonic weapons, which means that they need to be more precise to be effective. The Pentagon's budget reflects the growing importance of hypersonic weapons, with funding increasing from $2.6 billion in fiscal year 2020 to $3.9 billion in FY2026, for hypersonic research. Meanwhile, the Missile Defense Agency's (MDA) FY2026 request for hypersonic defense was $200.6 million.[15]

A key role in the development of hypersonic weapons is played by the Defense Advanced Research Projects Agency (DARPA). It is collaborating on the Tactical Boost Glide (TBG) and the Hypersonic Air-breathing Weapon Concept (HAWK) with the Air Force, focusing on an air-launched hypersonic cruise missile. By 2028, Virginia-class submarines might be equipped with the US Navy's Conventional Prompt Strike (CPS), which combines a hypersonic glider with a booster launched from the submarine. With a range of 2,770 km, the Long-Range Hypersonic Weapon (LRHW) of the Army uses a similar glide vehicle idea to that of the Navy.

Using hypersonic glide vehicle technology, the AGM-183 Air-Launched Rapid Response Weapon (ARRW) of the Air Force can launch from the air and have a 1,600 km range. The ARRW program encountered several test failures. The Air Force did not request procurement funding for it in its 2025 budget. However, as of mid-2025, the Air Force has indicated a renewed interest in reviving the ARRW program. The US hypersonic missile development has faced setbacks, and some high-ranking officials have raised concerns about the cost and rationale behind these

[14] James M. Acton, "Conventional Prompt Global Strike and Russia's Nuclear Forces," Carnegie Endowment for International Peace, October 4, 2013, accessed August 26, 2025, https://carnegieendowment.org/posts/2013/10/conventional-prompt-global-strike-and-russias-nuclear-forces?lang=en.

[15] Congress.gov, "Hypersonic Weapons: Background and Issues for Congress," October 23, 2025, https://www.congress.gov/crs-product/R45811.

programs. These critiques emerged following failed Air Force hypersonic boost-glide vehicle tests in 2021.

The US emphasizes hypersonic missile's role in deterring adversaries and maintaining long-range strike options. This focus on maintaining dominance aligns with the third offset strategy,[16] aiming to secure US military superiority over competitors and to maintain an edge in deterrence. Former Vice Chairman of the Joint Chiefs of Staff and former Commander of US Strategic Command General John Hyten, stated hypersonic missiles could enable "responsive, long-range, strike options against distant, defended, and/or time-critical threats when other forces are unavailable, denied access, or not preferred".[17] According to the US National Defense Strategy, through hypersonic weapons, the US "will be able to fight and win the wars of the future".[18] There is also considerable criticism of hypersonic systems, which are said to "lack defined mission requirements, contribute little to US military capability, and are unnecessary for deterrence".[19]

There is also considerable investment in counter-hypersonic weapons capabilities. The MDA is pursuing sea-based Glide Phase Intercept (GPI) to be operational by 2032. In May 2024 plans were finalized to co-develop GPI with Japan. The MDA is also developing the Hypersonic and Ballistic Tracking Space Sensor (HBTSS) to detect and intercept incoming missiles. MDA requested $76 million for HBTSS in FY2025.[20] The US administration under President Donald Trump is also pursuing "Golden Dome" missile defence system at a cost of $175bn which envisages space-based interceptors that envisage countering hypersonic missiles as well.[21]

The US hypersonic and counter-hypersonic technology has followed a classis action-reaction dynamic whereby it aimed to maintain a technological edge over adversaries.

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[16] Sander Ruben Aarten, "The Impact of Hypersonic Missiles on Strategic Stability: Russia, China, and the US," *Militaire Spectator* 189, no. 4 (2020): 185.
[17] Kelley M. Sayler, "Hypersonic Weapons: Background and Issues for Congress," Congressional Research Service Report R45811 (Washington, DC: Congressional Research Service, February 2024).
[18] U.S. Department of Defense, *Summary of the 2018 National Defense Strategy of the United States of America* (Washington, DC: U.S. Department of Defense, January 19, 2018), https://dod.defense.gov/Portals/1/Documents/pubs/2018%20National%20Defense%20Strategy%20Summary.pdf.
[19] Ibid
[20] Kelley Sayler, "Hypersonic Weapons: Background and Issues for Congress," Congressional Research Service Report R45811, October 24, 2025, https://www.congress.gov/crs-product/R45811.
[21] "Trump's 'Golden Dome' Defence Plan Includes Space Missiles, Lasers: Report," *Al Jazeera*, August 13, 2025, https://www.aljazeera.com/news/2025/8/13/trumps-golden-dome-defence-plan-includes-space-missiles-lasers-report.

US Hypersonic Missiles

Title	FY2023 Request ($ in millions)	FY2023 Enacted ($ in millions)	PB2024 ($ in millions)	Schedule
Conventional Prompt Strike (CPS)	1,205	1,230	901	Platform deployment in FY2025
Hypersonic Air-Launched OASuW (HALO)	92	152	96	Field by FY2029
Long-Range Hypersonic Weapon (LRHW)	806	872	943	Field two additional batteries by FY2027
AGM-183 Air-Launched Rapid Response Weapon (ARRW)	115	115	150	Complete prototyping and flight testing in FY2024

Fig. 2 [22]

- ***Russia: Countering Missile Defenses of the US***

Russia began developing hypersonic technology in the 1980s in reaction to the US Strategic Defense Initiative (SDI), popularly referred to as Star Wars. However, these initiatives fizzled out. Following the US's withdrawal from the Anti-Ballistic Missile Treaty (ABM Treaty),[23] the program saw a rebirth in 2001. From Russian perspective, hypersonic weapons were required to neutralize the missile defense systems of the US in Eastern Europe, which it saw as undermining deterrence. In his 2018 speech to the Federal Assembly, Russian President Putin revealed a variety of hypersonic weapons under development and clearly linked it to the potential danger presented by the missile defense of the US.[24] Putin said that the US did not pay any heed to Russian protests over fielding of US missile defence systems in Europe and elsewhere and stated "No one listened to us then. So, listen to us now." [25] Russian President Vladimir Putin and other officials time and

[22] Kelley M. Sayler, *Hypersonic Weapons: Background and Issues for Congress*, Congressional Research Service Report R45811 (Washington, DC: Congressional Research Service, February 2024), 10.
[23] Pavel Podvig, "Did Star Wars Help End the Cold War? Soviet Response to the SDI Program," *Science & Global Security* 25, no. 1 (2017): 3–27, https://scienceandglobalsecurity.org/archive/sgs25podvig.pdf.
[24] Vladimir Putin, "Presidential Address to the Federal Assembly," March 1, 2018, President of Russia (official website), http://en.kremlin.ru/events/president/transcripts/messages/56957.
[25] "Presidential Address to the Federal Assembly," March 1, 2018

again raised objections to US deployment of missile defence systems and also indicated that they would engage in offensive countermeasures to defeat US missile defences.[26]

Russia prioritized hypersonic missile development as a reaction to the US missile defence systems because it saw the systems as creating strategic instability. Russia boasts several hypersonic systems, including the Avangard, Kinzhal, and Tsirkon missiles, each offering distinct capabilities and deployment options. Russia has been manufacturing several systems in that regard, each with unique capabilities:

Russian Hypersonic Missiles

Missile System	**Type**	**Platform**	**Speed**	**Range**	**Warhead / Payload**
Avangard (HGV)	Hypersonic Glide Vehicle	Mounted on ICBMs (UR-100NUTTKh, future Sarmat)	Mach 20–27	Intercontinental	Strategic nuclear payload
3M22 Tsirkon (Zircon)	Hypersonic Cruise Missile	Ship- and submarine-launched	Mach 8–9	~1000 km (≈ 625 miles)	Conventional / tactical
Kh-47M2 Kinzhal	Air-Launched Ballistic Missile	MiG-31K, Tu-22M3 aircraft	Up to Mach 10	~2000 km (≈ 1200 miles)	Conventional or nuclear

Fig. 3[27]

Russian hypersonic technology development can be traced to the perceived threat from the US missile defence deployments, and the withdrawal from the ABM treaty, deepening its security dilemma vis a vis the US. Subsequently, the US hypersonic and counter hypersonic as well as BMD developments follow from perceived Russian threat, fueling an action-reaction cycle of arms racing and deepening their security dilemmas.

- ***China's Hypersonic Weapons: A Response to Perceived Threats***

China's growing hypersonic missile program stems from a complex security calculus. A key factor is the perceived threat posed by the US hypersonic development and advanced missile defense

[26] Stephen J. Cimbala, *The United States, Russia and Nuclear Peace* (Springer: Palgrave Macmillan, 2020), 52.
[27] Kelley Sayler, "Hypersonic Weapons: Background and Issues for Congress," October 24, 2025.

systems. Chinese officials have time and again expressed concerns with US missiles defence deployments. Scholarly literature often iterates Chinese concerns that US hypersonic weapons could potentially neutralize its nuclear deterrent through a decapitating first strike.[28] Moreover, US missile defense capabilities raise concerns about China's ability to retaliate effectively. This creates a security dilemma for China, prompting it to bolster its own hypersonic arsenal.

Chinese Hypersonic Weapons

Missile System	Type	Platform	Speed	Range	Warhead / Payload
DF-17	Hypersonic Glide Vehicle–Mounted MRBM	Road-mobile launcher	Estimated Mach 5–10	~1500 miles (≈ 2400 km)	Conventional (potential nuclear option debated)
DF-41 (HGV-configured variant)	ICBM capable of carrying Hypersonic Glide Vehicle	Silo-based, road-mobile, rail-mobile ICBM	Potential Mach 20+ (boost-glide)	Intercontinental	Nuclear
DF-ZF (WU-14)	Hypersonic Glide Vehicle	Launched on DF-17 and DF-21 boosters	Mach 5–10	~1200 miles (≈ 2000 km)	Conventional / nuclear capable
Starry-Sky 2 (Xing Kong-2)	Hypersonic Wave-Rider (powered hypersonic vehicle)	Rocket-boosted experimental testbed	Mach 5–6 (tested)	Undisclosed	Experimental payloads

[28] Tong Zhao, "Conventional Challenges to Strategic Stability: Chinese Perception of Hypersonic Technology and the Security Dilemma," Carnegie–Tsinghua Center for Global Policy, July 23, 2018, https://carnegietsinghua.org/2018/07/23/conventional-challenges-to-strategic-stability-chinese-perceptions-of-hypersonic-technology-and-security-dilemma-pub-76894.

Missile System	Type	Platform	Speed	Range	Warhead / Payload
YJ-21 (Air-Launched)	Hypersonic Anti-Ship Missile	H-6K bombers (air-launched)	Estimated Mach 8–10	~1500 km	Conventional (anti-ship)
YJ-17 (Surface-Launched)	Hypersonic Anti-Ship Ballistic Missile	Ground-based launchers	Likely Mach 8+	Estimated ~1000–1500 km (unconfirmed)	Conventional (anti-ship)
YJ-20 (Surface-Launched)	Hypersonic Anti-Ship Ballistic Missile	Ground-based launchers	Likely Mach 8+	Estimated similar to YJ-17 (unconfirmed)	Conventional (anti-ship)
CJ-1000	Hypersonic Land-Attack Cruise Missile (scramjet-powered)	Ground-launched / platform adaptable	Hypersonic (scramjet; Mach 5+)	Estimated medium-to-long range (details unpublicized)	Conventional

Fig. 4[29]

This technological race carries profound global and regional security implications.

- ***India: Entering the Fray***

India has also entered the hypersonic missile race with two key programs under the Defense Research and Development Organization (DRDO). The High-Speed Technology Demonstrator Vehicle (HSTDV) focuses on indigenous development, while the BrahMos-II project is being developed in collaboration with Russia.

The HSTDV development started in 2008. It first reaches a height of up to 20 km using scramjets, and it can achieve Mach 6. June 2019 saw its first successful test, and September 2020

[29] Prateek Tripathi, *How Hypersonic Weapons Are Redefining Warfare*, Observer Research Foundation, May 2, 2024, https://www.orfonline.org/expert-speak/how-hypersonic-weapons-are-redefining-warfare, Kelley Sayler, "Hypersonic Weapons: Background and Issues for Congress," October 24, 2025, https://www.congress.gov/crs-product/R45811, Gordon Arthur, "Xi's Military Parade Reached Climax with Flaunting Display of Strategic Weapons," *Asian Military Review*, September 12, 2025, https://www.asianmilitaryreview.com/2025/09/xis-military-parade-reached-climax-with-flaunting-display-of-strategic-weapons-foc/#.

saw another one in which it reached Mach 6 at a height of 30 kilometers. India conducted a test in January 2023.[30] India most recent test of HSTDV in November 2024, was designed to carry payloads for ranges exceeding 1,500 km.[31] It has been reported that the HSTDV could be employed for launching long-range cruise missiles as well as hypersonic ones. The development of the HSTDV pilot itself is said to have cost the DRDO $4.5 million.[32] In order to develop the HSTDV into a weaponized platform that can carry conventional or strategic warheads, DRDO plans to carry out additional testing.

India and Russia collaborated on BrahMos-II, their other hypersonic project, which is said to be modeled after the Russian Tsirkon. The anticipated range of the hypersonic cruise missile is 290 kilometers, and its payload capacity is 300 kg. With a combined investment of $250 million, both nations aim to achieve Mach 6 speeds using scramjet technology.[33] The project is anticipated to be deployed in 2028, although it has had multiple delays.

While India's hypersonic program may take another three to four years to mature, its potential impact is significant. These weapons could threaten regional security, particularly for Pakistan, exacerbate existing tensions, and heighten Pakistan's security dilemma.[34]

- ***Other Countries***

There is an increasing horizontal spread of hypersonic technology. Germany and UK are now investing in hypersonic missile technology, as are other nations including France and Japan. While South Korea is also entering the race fearing a threat from North Korea's hypersonic capabilities. Australia is also working on developing hypersonic technology in collaboration with the US.

[30] Prateek Tripathi, "How Hypersonic Weapons Are Redefining Warfare," *Observer Research Foundation*, May 2, 2024, https://www.orfonline.org/expert-speak/how-hypersonic-weapons-are-redefining-warfare.
[31] "India's Successful Test of Hypersonic Missile Puts It Among Elite Group," *Dawn*, November 17, 2024, https://www.dawn.com/news/1872984/indias-successful-test-of-hypersonic-missile-puts-it-among-elite-group.
[32] Mike Yeo, Nigel Pittaway, Usman Ansari, Vivek Raghuvanshi, and Chris Martin, "Hypersonic and Directed Energy Weapons: Who Has Them, and Who's Winning the Race in the Asia Pacific?" *Defense News*, March 15, 2021, https://www.defensenews.com/global/asia-pacific/2021/03/15/hypersonic-and-directed-energy-weapons-who-has-them-and-whos-winning-the-race-in-the-asia-pacific/.
[33] Richard H. Speier, George Nacouzi, Carrie Lee, and Richard M. Moore, *Hypersonic Missile Nonproliferation: Hindering the Spread of a New Class of Weapons* (Santa Monica, CA: RAND Corporation, 2017).
[34] Ghazala Yasmin Jalil, "India Joins the Global Hypersonic Missile Race," *ISSI Issue Brief*, January 16, 2025, https://issi.org.pk/issue-brief-on-india-joins-the-global-hypersonic-missile-race.

Hypersonic Weapons: A Double-Edged Sword for Global Security

Hypersonic weapons represent a paradigm shift in weapons development due to their unmatched speed and maneuverability. Hypersonic weapons introduce a new layer of complexity to international security. This technology presents both opportunities and challenges for deterrence and stability globally.

Hypersonic missiles are distinguished by their significantly shorter flight durations, which give their targets little time to respond.

Comparative Flight Times: Subsonic vs. Hypersonic Missiles

Missile System	Speed	Approx. Range Used in Example	Estimated Time to Target
Kalibr Cruise Missile (Russia)	Subsonic (~Mach 0.8)	1500 - 2,500 km	~2 hours
Kh-47M2	Hypersonic	2,000 km	~11 minutes
Kinzhal (Russia)	(up to Mach 10)	460-480 Km	~2.33 minutes
Avangard HGV (Russia)	Hypersonic (Mach 20–27)	6,000 km	~20 minutes
US Hypersonic Strike Systems (general)	Hypersonic (Mach 8+)	1,100 km	~9 minutes

Fig. 6[35]

The consequence is a significantly compressed decision window for potential targets. Traditional defense strategies rely on the Observe-Orient-Decide-Act (OODA) loop to assess threats and formulate responses. This drastically reduces the amount of time that the targeted countries have to identify, assess, and react to an assault. This shortened decision-making period raises the possibility of error and unintentional escalation between the nuclear powers.

[35] Alan Cummings, "Hypersonic Weapons: Tactical Uses and Strategic Goals," *War on the Rocks*, November 12, 2019, https://warontherocks.com/2019/11/hypersonic-weapons-tactical-uses-and-strategic-goals/.

Observe Orient Decide and Act (OODA) loops[36]

The tremendous speed, compressed decision window, and shortened reaction times associated with hypersonic weapons injects a new element of danger into nuclear deterrence. Some experts worry that a nation such as China, which has few systems for early detection, could only have three minutes' notice before a Mach 10 missile at 20 kilometers above the ground hits a target. On the other hand, a Mach 6 hypersonic weapon gives you just eleven minutes to respond.[37] The US has weapons system under the Conventional Prompt Strike program, the LRHW and ARRW that can strike China. According to some accounts "the Hypersonic Technology Vehicle 2 (HTV-2) is planned to have a strike range of about 17,000 km, which could reach China if launched from the continental United States. Even shorter-range systems like the Advanced Hypersonic 30 Weapon (AHW), which has a planned range of about 8,000 km and a tested range of over 3,800 km, can reach targets deep in China when launched from Guam."[38]

Such compressed decision windows significantly heighten the risk of miscalculation. With nuclear powers involved, misinterpreting an attack could have catastrophic consequences. Nations may be encouraged to take a launch-on-warning stance and possibly contemplate preemptive strikes as a result of the pressure to act swiftly. The threshold for using nuclear weapons could be

[36] Author's own analysis, based on Alan Cummings, "Hypersonic Weapons: Tactical Uses and Strategic Goals," *War on the Rocks*, November 12, 2019, https://warontherocks.com/2019/11/hypersonic-weapons-tactical-uses-and-strategic-goals/.
[37] Tong Zhao, "Conventional Challenges to Strategic Stability: Chinese Perception of Hypersonic Technology and the Security Dilemma," *Carnegie–Tsinghua Center for Global Policy*, July 23, 2018, 6, https://carnegietsinghua.org/2018/07/23/conventional-challenges-to-strategic-stability-chinese-perceptions-of-hypersonic-technology-and-security-dilemma-pub-76894.
[38] Ibid.

lowered by this weakening of deterrence, which could also make unintentional launches more likely.[39]

Because of their speed and agility, hypersonic weapons present a serious threat to current missile defense systems. Unlike traditional ballistic missiles with their parabolic arc-like trajectory, hypersonic missiles pose a significant threat due to their ability to achieve speed and maneuverability. This combination makes them incredibly difficult to intercept. Ballistic missile defense systems rely on early detection and predictable trajectories for successful interception. However, hypersonic missiles can evade detection until mere minutes before impact, significantly reducing reaction time. For example, a 3,000-kilometer-range long-range ballistic missile may be picked up by a surface-based radar about 12 minutes before it strikes. In contrast, the same radar would only have about 6 minutes to identify an incoming hypersonic glide vehicle (HGV) – a crucial difference that severely limits defensive capabilities.[40] This cuts down the detection and response duration markedly. This enables states with hypersonic missiles to penetrate an adversary's missile defense systems.

Hypersonic weapons provide a means for China and Russia to overcome the missile defenses of the US and reinstate the fundamental principle of nuclear deterrence - the idea of mutually assured destruction. The efficiency of Russia's nuclear weapons, especially its capacity to react in the event of a second strike, is seen as threatened by the missile defense systems of the US especially after the development. At the moment the US has limited boost phase, midcourse and terminal interception capabilities with Ground Based Interceptors (GBIs) deployed in at Fort Greely, Alaska, and Vandenberg Space Force Base, California.

Irrespective of US claims, these systems have some limited capabilities to intercept Russian missiles. In Russia's view, missiles with hypersonic capabilities offer the most reliable means to bypass US defenses and restore the credibility of its nuclear deterrent. China shares similar concerns regarding the missile defense systems of the US and its advanced conventional arms. While Russia's second-strike capability is less vulnerable due to a large nuclear force of estimated 5,459 warheads, China with a modest nuclear arsenal comprised of estimated 600 weapons is more

[39] Jeffrey Hill, "Hypersonic Highly Maneuverable Weapons and Their Effect on the Deterrence Status Quo," in *Assessing the Influence of Hypersonic Weapons on Deterrence*, ed. Paige Cone, *The Counter-proliferation Papers, Future Warfare Series* no. 59 (Maxwell AFB, AL: USAF Center for Strategic Deterrence Studies, Air University, June 2019), 68.

[40] R. H. Speier et al., *Hypersonic Missile Nonproliferation: Hindering the Spread of a New Class of Weapons* (Santa Monica, CA: RAND Corporation, 2017), 3, https://www.rand.org/pubs/research_reports/RR2137.html.

vulnerable.[41] China worries that such systems fielded by the US could render China's smaller nuclear arsenal vulnerable to a preemptive attack, potentially undermining its ability to retaliate. This perception drives China's pursuit of hypersonic weapons as a means to strengthen its nuclear deterrence posture.[42] Tong Zhao, an expert from China states: "Beijing's efforts to follow Washington's example in developing hypersonic technology are then causing US suspicion about China's intentions. Many in Washington see China's growing hypersonic capability as a new military threat and believe the US should take measures to counter such threat. Such action-reaction dynamic is fueled by lack of accurate understanding about the nature of and motivation behind each other's programs and contributes to existing security dilemma".[43]

Hypersonic weapons also play a part in the A2/AD strategy. For countries like Russia and China using an A2/AD strategy can deploy hypersonic missiles to make the cost of intervening in a contested region unacceptably high for an adversary. For countries like the US hypersonic weapons are seen as a way to negate or pierce the enemy's A2/AD defenses. Thus, a typical security dilemma is created when big states develop hypersonic arms.

[41] Hans M. Kristensen and Matt Korda, "World Nuclear Forces," in *SIPRI Yearbook 2025: Armament, Disarmament and International Security* (Stockholm: Stockholm International Peace Research Institute; Oxford: Oxford University Press, 2025).
[42] Tong Zhao, "Conventional Challenges to Strategic Stability: Chinese Perceptions of Hypersonic Technology and the Security Dilemma," *Carnegie–Tsinghua Center for Global Policy*, July 23, 2018, https://carnegietsinghua.org/2018/07/23/conventional-challenges-to-strategic-stability-chinese-perceptions-of-hypersonic-technology-and-the-security-dilemma-pub-76894.html.
[43] Tong Zhao, "Conventional Challenges to Strategic Stability: Chinese Perception of Hypersonic Technology and the Security Dilemma," *Carnegie–Tsinghua Center for Global Policy*, July 23, 2018, 22, https://carnegietsinghua.org/2018/07/23/conventional-challenges-to-strategic-stability-chinese-perceptions-of-hypersonic-technology-and-the-security-dilemma-pub-76894.html.

Detection of Ballistic missiles Vs Hypersonic Glide Vehicles

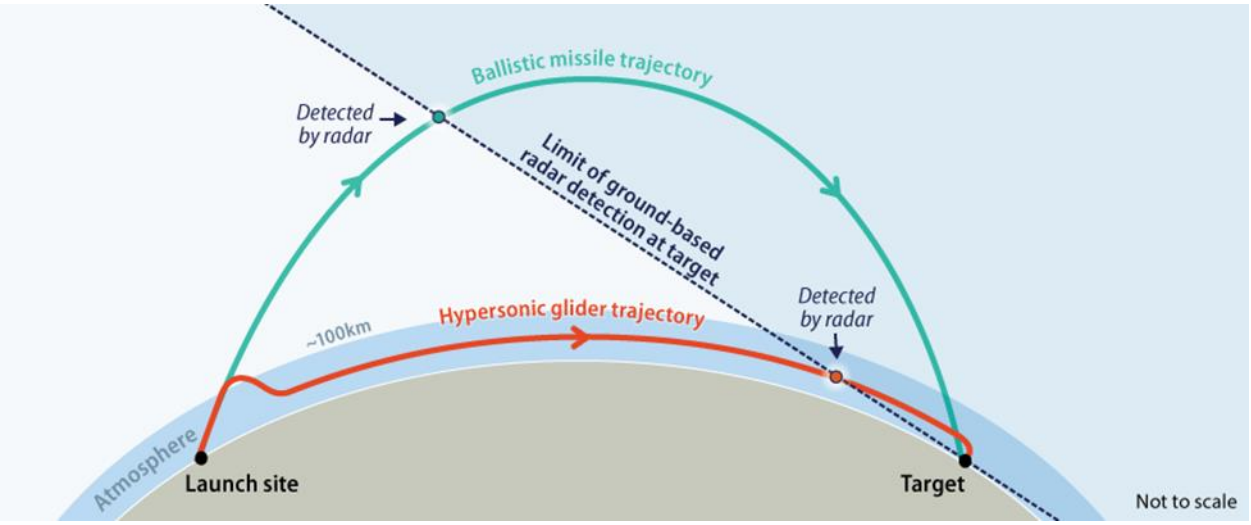

Fig 7[44]

Competitors view each country's quest for hypersonic capabilities as a threat and increase their investments in both this technology and counter-hypersonic defenses. This action-reaction cycle fuels an arms race with potentially destabilizing consequences. The US feels threatened by Russian and Chinese hypersonic weapons which are already deployed and seeks to augment its deterrence. The US is especially working on counter-hypersonic technology to be fielded in the late 2020s. It is also collaborating with allies to develop technology to defeat hypersonic weapons. Japan and the United States inked a deal in May 2024 to work together on the Glide Sphere Interceptor, a new missile defense system that will be deployed by the middle of the next decade to combat the threat posed by hypersonic missiles.[45]

The development of hypersonic missiles by other states like Japan, Australia, Germany, France, and UK will further complicate the deterrence calculations of Russia and China. While the development of hypersonic capability complicates, North Korea is a source of concern for the US and its allies especially the neighboring South Korea, which is pursuing hypersonic weapons of its

[44] Kelley M. Sayler, *Hypersonic Weapons: Background and Issues for Congress*, Congressional Research Service Report R45811 (Washington, DC: Congressional Research Service, February 2024).
[45] "Japan, US to Develop Missile Defense System to Counter Hypersonic Weapons Threat," *Associated Press*, May 16, 2024.

own. Thus, this creates a domino effect of threat perceptions and subsequent hypersonic weapons development fueling destabilising arms race.

The other factor that can lead to destabilization is the issue of hypersonic missiles with conventional warheads, which brings up issues diluting the difference between conventional and strategic warfare. A devastating nuclear counterattack could occur if a hypersonic attack is mistakenly identified with a conventional or nuclear warhead.

Development of hypersonic missiles leads to complex conditions as far as international deterrence is concerned. On one hand, such weapons also give Russia and China certain security, as it might be possible to defeat the US missile defense and bring both countries to the same level. However, hypersonic missiles are more rapid. This is why there are more chances of misperception and unexpected escalation. It also enhances security dilemma among the major powers. This further aggravates the existing security tensions and leads to the emergence of a new arms race, which can accomplish development to even new heights of advanced counter-hypersonic missile systems.

Hypersonic Weapons: A Threat in South Asia

The hypersonic missile race takes a different angle in South Asia as the Indian race on this technology adds turmoil to an already volatile area. Pakistan and India, two nuclear-armed nations with a long history of distrust and conflict, make South Asia different from the rest of the world. Hypersonic missile introduction in this case would impact and alter the regional balance of power and the current deterrence calculations.

The introduction of hypersonic missiles in South Asia by India, could create a significant power imbalance. Hypersonic weapons' speed and maneuverability would give India a potential first-strike advantage. India might use hypersonic missiles to undertake a surprise attack with the goal of destroying Pakistan's strategic stockpile before a counterattack could be carried out. Any remaining counter missiles can, in theory, be intercepted with its missile defense systems. The literature provides support that the target state may be disarmed before it can respond if hypersonic missiles are utilized against countries with weak strategic capabilities.[46] India is also abandoning its policy of No First Use.[47]

[46] Speier et al., *Hypersonic Missile Non-Proliferation*, xi.
[47] Kumar Sundaram and M. V. Ramana, "India and the Policy of No First Use of Nuclear Weapons," *Journal for Peace and Nuclear Disarmament* 1, no. 1 (2018).

The development of precision attack weaponry and India's shift towards a preemptive stance against Pakistan are also supported by the literature.[48] In order to support that goal, it is also creating a specialized military space program. Furthermore, India is shifting its policy against Pakistan from one of countervalue to one of counterforce. The development of hypersonic missiles by India is consistent with that strategy. This is particularly concerning for Pakistan. The threshold for nuclear war might be significantly lowered by the possibility of a use-it-or-lose-it scenario. Thus, this is extremely disruptive in South Asia, which is a fragile nuclear region.

The present missile flight durations of 5–10 minutes between India and Pakistan are frighteningly low. Hypersonic technology would drastically slash this window, potentially reducing it to few minutes. This compressed timeframe significantly reduces Pakistan's reaction time, heightening the risk of miscalculations and unintended escalation. As a result, the threat of nuclear conflict in South Asia intensifies. A Pakistani analyst, Adil Sultan,[49] says that in a conflict, "the Indian military planners could employ these weapon systems against Pakistan's short-range ballistic missiles (SRBMs) 'Nasr' for two apparent reasons: One, it will deter Pakistan from the early deployment of its tactical nuclear weapons and create space for India's Cold Start Doctrine (CSD); and secondly, the use of hypersonic weapons with conventional warheads, from an Indian perspective, could reduce the justification for nuclear retribution from the Pakistani side".[50]

[48] Christopher Clary and Vipin Narang, "India's Counterforce Temptations: Strategic Dilemmas, Doctrine, and Capabilities," *International Security* 43, no. 3 (Winter 2018/19).
[49] Adil Sultan, "Emerging Doctrines and Technologies in South Asia: Implications for Strategic Stability," *Strafasia*, September 9, 2020, https://strafasia.com/emerging-doctrines-and-technologies-in-south-asia-implications-for-strategic-stability.
[50] Adil Sultan, "Emerging Doctrines and Technologies in South Asia: Implications for Strategic Stability."

Comparison of Supersonic and Hypersonic Missile Flight Times

Type	Speed in Mach	Speed Km/ sec	Time(minutes) Delhi to Lahore
Sub-sonic (Nirbhay)	0.8	0.27 km/ sec	26.17
Supersonic Agni - I	2.5	0.86 km/ sec	8.21
Hypersonic Cruise Missile	Mach 7	2.40 km/ sec	2.94

Fig. 8[51]

When we look at hypersonic technology globally versus in South Asia, the security dynamics tell two very different stories. On the global stage, it is not just China and Russia building hypersonic to beat US defenses; the US is technically in the same boat, pushing concepts like the "Golden Dome" because Russia possesses some of the world's most advanced missile shields. However, the superpower equation is stabilized by sheer volume. Russia and the US have thousands of warheads, and since no interceptor system has a 100% success rate against that kind of saturation, mutual destruction is still assured. China, with its smaller arsenal compared to them, faces a different calculation, but the South Asian reality is unique.

While India's push for hypersonic missiles and ballistic missile defense is technically inspired by these international trends and prestige, its strategic aim is apparently Pakistan-centric, driven by deep-rooted tensions over territory and water issues. In this regional setting, where flight times are short and arsenals are smaller, India's missile defenses do not just modernize its military; they fundamentally challenge Pakistan's nuclear deterrence, creating a dangerous imbalance.

Hypersonic also fit into Indian precision strike weaponry category which it can use to exercise preemptive strike option against Pakistan should it chose to. One Pakistani analyst puts it aptly: "development of these missiles having shorter and intermediate ranges feed India's counterforce temptations … Shourya HSW (hypersonic weapon) with its 750km range can easily

[51] Adil Sultan and Itfa Khursheed, "Hypersonic Weapons in South Asia: Implications for Strategic Stability," *IPRI Journal* 11, no. 1 (2021).

target all of Pakistan's strategic locations - thus augmenting a counter-force mission against Pakistan. Similarly, BrahMos is also 'uniquely tailored' for a counterforce role".[52] Many analysts and decision makers in Pakistan believe that Indian hypersonic weapons are targeted against Pakistan.

All things considered, hypersonic missiles would give India a major advantage in the strategic deterrent equation, possibly jeopardizing Pakistan's capacity to conduct a guaranteed counterattack in an emergency. It exacerbates Pakistan's security predicament and presents new security concerns. It will probably trigger a new arms race because Pakistan would develop countermeasures.

Options for Pakistan

There are a number of strategic options available to Pakistan. One option is to make quantitative adjustments to its nuclear arsenal. Increasing the number of warheads would ensure a credible response even if India attempts a surprise attack. This would ensure that some nuclear weapons survive an Indian first strike, and Pakistan can still have a counter strike capability.

Pakistan could also combine increase in number of weapons with strategies like mobility, dispersion, and camouflage of its nuclear forces. Some analysts endorse this approach: "Pakistan could work on further improving the mobility of its SRBMs besides increasing their numbers with a greater mix of missiles with conventional and nuclear warheads. This is likely to complicate adversary's calculation, but it also raises the possibility of unintended escalation".[53]

To be able to fend off India's hypersonic missiles and preemptive counterforce temptations, Pakistan must bolster its sea-based nuclear deterrence. The Babur-3 cruise missile with 450 km range was tested in 2017.[54] This is especially aimed at circumventing missile defense systems. However, for a robust second-strike option, Pakistan needs to diversify its sea-based platforms. By

[52] Ayesha Abbasi, "Indian Quest for Hypersonic Missiles in South Asia and Disruption of Strategic Stability in the Indo-Pak Dyad."
[53] Adil Sultan and Itfa Khursheed, "Hypersonic Weapons in South Asia: Implications for Strategic Stability," *IPRI Journal* 11, no. 1 (2021): 18, https://journal.ipripak.org/wp-content/uploads/2021/07/Article-3-IPRI-Journal-XXI-1.pdf.
[54] Ghazala Yasmin Jalil, "Missile Race in South Asia: Security Challenges for Pakistan in the 21st Century," *Strategic Studies* 40, no. 1 (2020): 51.

providing Pakistan with a guaranteed second-strike capability, it would dissuade India from making any preemptive moves.

To counter India's hypersonic edge, Pakistan may consider developing its own hypersonic capabilities. Pakistan could invest in scramjet research and development to create its own hypersonic missiles. However, this path is expensive and technologically demanding. While hypersonic weapons offer advantages in penetrating defenses and restoring deterrence balance, the significant costs and technological hurdles remain a challenge.

Conclusion

The advent of hypersonic weapons casts a shadow over global and regional security landscapes, impacting nuclear deterrence, accelerating arms races, and strategic stability. Globally, it is a double-edged sword. For Russia and China, hypersonic weapons offer a potential path to restoring deterrence by penetrating US missile defenses. However, the hypersonic missiles would likely lead to an arms race too as nations scramble for superior speed and countermeasures. This competition leading to a deadly arms race with ever-faster and more sophisticated hypersonic weapons. They are destabilizing since sheer speed of these weapons leaves less time for detection and reaction, heightening the risk of miscalculations and inadvertent escalation. This could lead to a lower nuclear threshold**.** Hypersonic weapons risk exacerbating the security dilemma. The action-reaction cycle between major powers could lead to a perpetual state of tension and distrust.

India's pursuit of hypersonic missiles threatens to disturb the precarious strategic balance in South Asia. India's BMD capability, coupled with hypersonic missiles, could erode Pakistan's deterrent capability. This asymmetric advantage might tempt India towards a preemptive strike strategy. This scenario significantly increases the chances of a devastating conflict, transforming South Asia into a volatile nuclear tinderbox. It deepens Pakistan's security dilemma. To maintain a credible deterrent, Pakistan may be forced to invest in counter-hypersonic technologies, develop its own hypersonic missiles, and reassess its nuclear posture. Ultimately, the introduction of hypersonic weapons in South Asia risks triggering a destabilizing arms race.

Hypersonic weapons' potential to cause instability in South Asia emphasizes how urgently international arms control measures are needed. Without laws to control the creation and spread of these weapons, the area would be caught up in a risky arms race with possibly disastrous

outcomes. However, achieving such agreements amidst existing political tensions and a lack of trust seems like a distant prospect. The international community must find innovative ways to foster dialogue and cooperation among major powers and between India and Pakistan to prevent a hypersonic arms race from taking root in South Asia. This could involve confidence-building measures such as hypersonic missile notifications, joint technical verification measures, regional risk reduction initiatives, and the pursuit of multilateral arms control treaties specifically focused on hypersonic technologies.