

# Hypersonic Weapons in South Asia: Implications for Strategic Stability

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## Abstract

*The development of new technologies and their use for military means has narrowed the gap between the technologically advanced and less developed countries.<sup>1</sup> This may have disturbed the traditional balance of power with greater prospects of conflict between states with asymmetric military potential, besides increasing the risks of conventional and nuclear entanglement.<sup>2</sup> The dangers are more pronounced in South Asia where growing conventional disparity coupled with new war fighting doctrines continue to strain strategic stability, thus making it imperative for the other side to strengthen its 'cross domain' deterrence posture.<sup>3</sup> India's recent test of Hypersonic Technology Demonstrator Vehicle (HSTDV),<sup>4</sup> which apparently aims to build its credentials of a technologically advanced country; once operationalised, would proffer an option of a preemptive conventional counterforce strike against Pakistan's short range ballistic missiles (SRBMs) – to deter Pakistan from the early deployment of its SRBMs and to create space for India's limited war fighting doctrine of 'Cold Start.' In response, Pakistan is likely to develop countermeasures that could ensure the integrity of its Full Spectrum Deterrence (FSD) posture. This action-reaction syndrome could trigger a new arms race with increased risks of miscalculation in a future military crisis between the two nuclear armed states. This paper aims to discuss*

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*the ongoing global developments in the field of hypersonic weapons; its implications for strategic stability in South Asia; and Pakistan's likely response options.*

**Keywords:** Hypersonic Weapons, South Asia, Strategic Stability, Nuclear Weapons, Arms Race, Nuclear Entanglement

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<sup>1</sup> Remarks by Dr Fillipo Neri at the International Seminar on “Global Strategic Threats and Responses” (GSTAR) hosted by Centre for Aerospace and Security Studies (CASS), Islamabad, March 4-5, 2020 <https://www.youtube.com/watch?v=numOQAgzbl0>.

<sup>2</sup> James Acton, “Nuclear Entanglement”, *Carnegie Endowment for International Peace (CEIP)*, <https://carnegieendowment.org/programs/npp/nuclear-entanglement>.

<sup>3</sup> King Mallory, “New Challenges in Cross-Domain Deterrence”, *RAND Corporation*, 2018, p.1. [https://www.rand.org/content/dam/rand/pubs/perspectives/PE200/PE259/RAND\\_PE259.pdf](https://www.rand.org/content/dam/rand/pubs/perspectives/PE200/PE259/RAND_PE259.pdf).

<sup>4</sup> “India test-fires hypersonic technology demonstrator vehicle; joins select group”, *The Economic Times*, Sept 12, 2020. <https://economictimes.indiatimes.com/news/defence/defence/india-test-fires-indigenously-developed-hypersonic-technology-demonstrator-vehicle/articleshow/77974388.cms>.

## Introduction

The advent of new technologies may have increased the prospects of a conflict between nuclear weapon states that traditionally have relied on their deterrence postures to avoid getting embroiled in major wars. Some states are in the process of developing cyber weapons at a relatively low cost. They can target adversary's critical assets and render these as ineffective. The use of Stuxnet against Iran's nuclear facilities and the more recent development of 'Nitro Zeus'<sup>5</sup> by the US which are aimed at disabling adversary's air defences, communication system, power grid, and other critical assets before a military intervention, or to cater for a 'loose nuke scenario'<sup>6</sup> -- are some of the examples where states can use or threaten the use of their cyber capabilities to achieve political objectives. Development of anti-satellite weapons has emerged as another major concern as it could lead to conventional and nuclear entanglement and complicate deterrence equation between nuclear weapon states. Similarly, some of the early warning satellites, which are used for both nuclear and non-nuclear operations, if targeted by conventional and cyber-attacks, may force the adversary to misinterpret it as a preparation for a nuclear attack. To cater for such a scenario, the US nuclear posture has classified all space-based infrastructures as 'vital,' which if threatened could possibly trigger a nuclear response.<sup>7</sup>

Hypersonic weapons are another emerging threat that could be destabilising, especially amongst the nuclear armed states. Due to their maneuverability and high speed,<sup>8</sup> hypersonic weapons can evade adversary's ballistic missile defence systems. However, if used for precision strikes against adversary's offensive forces, these weapons can

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<sup>5</sup> "U.S. Had Cyber Attack Plan if Iran Nuclear Dispute Led to Conflict", *The New York Times*, Feb 16, 2016. <https://www.nytimes.com/2016/02/17/world/middleeast/us-had-cyberattack-planned-if-iran-nuclear-negotiations-failed.html>.

<sup>6</sup> Ibid.,

<sup>7</sup> "Whither Arms Control in Outer Space? Space Threats, Space Hypocrisy, and the Hope of Space Norms", Remarks by Christopher Ashley Ford, Assistant Secretary Bureau of International Security and Nonproliferation. CSIS Webinar on "Threats Challenges and Opportunities in Space," Apr 6, 2020, Washington D.C. <https://www.state.gov/whither-arms-control-in-outer-space-space-threats-space-hypocrisy-and-the-hope-of-space-norms/>.

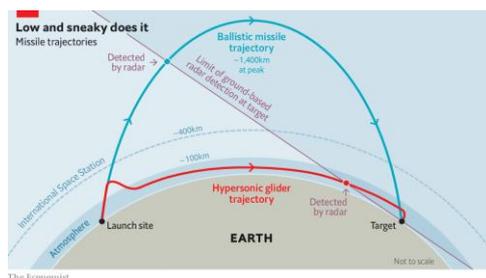
<sup>8</sup> Alan Cummings, "Hypersonic Weapons: Tactical Uses And Strategic Goals," *War On The Rocks*, Nov 12, 2019. <https://warontherocks.com/2019/11/hypersonic-weapons-tactical-uses-and-strategic-goals/>.

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give advantage at the very onset of a war. Most countries that are developing these weapons prefer to use conventional warheads so as to make these useable. However, countries like Russia have already added a nuclear tipped variant that could encourage some other countries, especially the US to consider developing a nuclear version, while officially it might continue to assert that its hypersonic weapons would carry only conventional warheads.<sup>9</sup>

### Differentiating the HGVs and the HCMs

Hypersonic Weapons combine the speed of a ballistic missile with an advanced maneuvering capability of a cruise missile. Their prompt delivery can overcome constraints of distance, time and missile defenses and compressing adversary's Observe, Orient, Decide, and Act (OODA) cycle,<sup>10</sup> thus offering incentive for an offensive preemptive strike. This makes it an attractive choice of weapon for several major powers. The hypersonic weapons are classified into two main types, i.e. Hypersonic Glide Vehicles (HGVs) and Hypersonic Cruise Missiles (HCMs).



Source: *The Economist*<sup>11</sup> (The OODA loop (Observe, Orient, Decide, Act) is a four-step approach to decision-making that focuses on filtering available information, putting it in context and quickly making the most appropriate decision while also understanding that changes can be made as more data becomes available.)

The HGVs are mounted on a rocket booster that goes to the outer atmosphere at a speed of more than Mach 5. After reaching 40 to 100 km from the earth surface, the vehicle gets separated from its booster and is propelled by its momentum, skimming through the thin layers of the upper atmosphere, without making a predictable ballistic trajectory. Some of the

<sup>9</sup> Alan Cummings, "Hypersonic Weapons: Tactical Uses And Strategic Goals," *War On The Rocks*, Nov 12, 2019. <https://warontherocks.com/2019/11/hypersonic-weapons-tactical-uses-and-strategic-goals/>.

<sup>10</sup> The militaries generally use OODA loop to cater for response time to a particular threat or in dealing with contingencies.

<sup>11</sup> "Gliding missiles that fly faster than Mach 5 are coming," *The Economist*, April 6, 2019, <https://www.economist.com/science-and-technology/2019/04/06/gliding-missiles-that-fly-%20faster-than-mach-5-are-coming>.

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longer-range ballistic missiles also fly at hypersonic speeds, but the HGVs besides having the ability to maneuver make relatively lower apogee up to stratosphere (upper atmosphere). This helps reduce the susceptibility to adversary's radar detection.

Hypersonic Cruise Missiles (HCMs), on the other hand, do not require a rocket booster or follow a ballistic trajectory. They are powered by supersonic combustion ramjet (scramjet), an air-breathing engine which takes oxygen from the atmosphere and mixes it with the hydrogen fuel to produce combustion for its propulsion. Since HCMs are powered by an onboard engine, therefore, it has relatively shorter range than the HGVs.<sup>12</sup>

#### **Difference between HGVs and HCMs**

<b>Characteristics</b>	<b>HGVs</b>	<b>HCMs</b>
<b>Operating Mechanism</b>	Uses rocket boosters for launch	Uses SCRAMJET engine
<b>Flight Pattern</b>	Ballistic trajectory before separating from rocket motor	No ballistic trajectory
<b>Launch platform</b>	Land or air	Land, sea, air
<b>Range</b>	Medium and Long range	Relatively shorter range
<b>Altitude</b>	40 to 100 km	< 40 km
<b>Power Supply</b>	Glides towards its target	Powered by onboard engine
<b>Maximum Range</b>	Up to 6,000 km	1,000 – 3000 km <sup>13</sup>
<b>Speed</b>	Mach 5 to 27	Mach up to 10

#### **Emerging Global Trends**

The research and development in hypersonic weapons started in the late 1950s, when the US launched its project 'Dyna-Soar' to develop boost-glide systems but the program was shelved in 1963.<sup>14</sup> Russia also started

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<sup>12</sup> Richard H. Speier et al., "U.S.-Russia-China Cooperation Could Hinder the Proliferation of Hypersonic Missiles", RAND Corporation, 2019, [https://www.rand.org/pubs/research\\_reports/RR2137.html](https://www.rand.org/pubs/research_reports/RR2137.html).

<sup>13</sup> Russia's 3M-22 Tsirkon which is an HCM has a range of 1,000 km and the efforts are underway to extend its range further up to 2,000-3,000 km.

<sup>14</sup> Nicholas Michael Sambaluk, "The Other Space Race: Eisenhower and the Quest For Aerospace Security", (Naval Institute Press, 2015). pp 2

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its hypersonic weapons program in 1990s and after more than thirty years of research and development, it became the first country to develop and operationalise these weapons.<sup>15</sup> The next country that started developing hypersonic weapons in 2000s was China, which has now operational hypersonic weapons. The United Kingdom, France and India are also in the process of developing hypersonic weapons as these countries don't want to be left behind and would like to remain relevant in the global power competition.

One of the major considerations for states like Russia and China to build hypersonic weapons was the US withdrawal from the anti-ballistic missile (ABM) treaty, which was negotiated in 1972 and had quite successfully limited the number of deployed ABM systems.<sup>16</sup> The US decision to unilaterally abandon the ABM treaty and place its interceptor missiles around the Russian periphery was seen as a serious challenge to the credibility of the Russia's nuclear deterrence. This may have forced Russia to develop options that could help restore the balance between the two global powers.<sup>17</sup>

A brief review of the ongoing competition in the field of hypersonics would be useful to understand the political and security imperatives that may shape the future technological competition and its implications for other countries, especially in a region like South Asia where the impact of global power competition could provide new impetus to regional arms competition between India and Pakistan.

### **Russia: Leading the Hypersonic Race**

As stated earlier, Russia's hypersonic pursuit emerged as a priority issue after the US decided to abandon the ABM treaty in 2002. One of the possible reasons for Russia to embark upon new technologies could be that it wants to engage the US on the principle of parity and strengthen its

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<sup>15</sup> Michael Kofman, "Beyond the Hype of Russia's Hypersonic Weapons", *The Moscow Times*, 26 January, 2020, <https://www.themoscowtimes.com/2020/01/15/russias-hypersonic-weapons-a68907>.

<sup>16</sup> "The Anti-Ballistic Missile (ABM) Treaty at a Glance | Arms Control Association", *Armscontrol.Org*, 2017, <https://www.armscontrol.org/factsheets/abmtreaty>.

<sup>17</sup> "Hypersonic weapons and strategic stability", *Strategic Comments*, International Institute for Strategic Studies (IISS), Volume 26, 04 March 2020. <https://www.iiss.org/~/publication/23a21359-6cb1-4355-b6be-f6aba4a5c1e9/hypersonic-weapons-and-strategic-stability.pdf>.

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bargaining position for negotiating new arms control arrangements in the future, or possibly extending the existing ones, such as the New START.<sup>18</sup>

Russia's first hypersonic glide vehicle 'Avangard' was formally announced in December 2019.<sup>19</sup> This is a boost glide weapon that can be launched from 'Sarmat' ICBM and has a range of over 6,000 km. It can travel at a speed between Mach 20 to 27. It is capable of carrying both conventional and nuclear warheads, and has the ability to neutralise all known missile defences.<sup>20</sup> Russia has also operationalised its air launched ballistic missile (ALBM) Kh-47M2 Kinzhal (Dagger), which is also a hypersonic weapon with anti-ship and land-attack specifications, and can hit targets up to a range of 2000 km. Kinzhal can attain a speed of Mach 4 to 10 and carries both conventional and nuclear warheads.<sup>21</sup> Russia is also developing anti-ship hypersonic missile, 3M22 Zircon (Tsirkon) with an expected speed of Mach 6 to 9 that can go between 250 to 600 miles and is capable of hitting both land and naval targets. It was successfully tested in 2018 and can be launched from multiple platforms.<sup>22</sup>

Russia's development and deployment of hypersonic missiles could increase its bargaining position with the US. At the same time, it also complicates NATO's strategic calculations and the alliance's missile defence capabilities, which in return may force the US to explore ways to maintain its fast receding military dominance in the region.<sup>23</sup>

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<sup>18</sup> Jill Hruby, "Russia's New Nuclear Weapon Delivery Systems", *Nuclear Threat Initiative*, 2019, [https://media.nti.org/pdfs/NTI-Hruby\\_FINAL.PDF](https://media.nti.org/pdfs/NTI-Hruby_FINAL.PDF).

<sup>19</sup> John Borrie, Amy Dowler and Pavel Podvig, "Hypersonic Weapons: A Challenge and Opportunity for Strategic Arms Control", United Nations Institute for Disarmament Research, Feb 14, 2019, <https://unidir.org/publication/hypersonic-weapons-challenge-and-opportunity-strategic-arms-control>.

<sup>20</sup> "The Speed Of War: Faster Weapons; Faster Organizations", International Institute for Strategic Studies, 2018, <https://www.iiss.org/publications/strategic-survey/strategic-survey-2018-the-annual-assessment-of-geopolitics/ss18-04-strategic-policy-issues-4,23-32>

<sup>21</sup> CSIS Missile defense Project. <https://missilethreat.csis.org/missile/kinzhal/>

<sup>22</sup> "3M22 Zircon – Missile Defense Advocacy Alliance", Missiledefenseadvocacy.Org, <https://missiledefenseadvocacy.org/missile-threat-and-proliferation/todays-missile-threat/russia/3m22-zircon/>.

<sup>23</sup> Emmott, Robin and Phil Stewart. "NATO Weighs Options to Deter New Russian Missile Threat." The Star Online, December 31, 1969. <https://www.thestar.com.my/news/world/2019/06/27/nato-weighs-options-to-deter-new-russian-missile-threat>.

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For now, Russia has an edge in the hypersonic field but several countries are rushing to build their own capabilities. This would eventually neutralise Russia's military advantage. However, to maintain its lead in the hypersonic field, Russia has already started developing systems that could intercept adversary's hypersonic weapons. Russia's advanced S-500 Prometheus Air Defence system, which may enter into service in the near future will be able to operate near space at ultra-high altitudes and is slated to have the capability of destroying hypersonic weapons besides other futuristic offensive missile systems of the adversary.<sup>24</sup>

### **US Urgency to Compete in the Hypersonic Field**

The US security strategy since 9/11 remained focused on the projection of non-nuclear capabilities and maintaining military advantage over other states, especially Russia and China.<sup>25</sup> The Prompt Global Strike (PGS) mission announced in 2003, was aimed at delivering precision munitions with conventional warheads to longer distances and various theatres of conflict, but enhancing speed of missiles was not seen to be a major concern. However, recent achievements by its adversaries have brought a renewed sense of urgency within the defence department, to fast track the hypersonic program and enable the US military to compete, deter, and if necessary, to win the future wars involving the new technologies.<sup>26</sup> One of the key areas identified in the 2020 budget is to support a national defence strategy that focuses on 'rebuilding readiness and lethality.'<sup>27</sup> With additional allocation of \$100 million, a joint industry-academia-

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<sup>24</sup> "Russia Touts S-500'S Ability To Destroy Hypersonic Weapons In Space - The Moscow Times", The Moscow Times, July 03,2020, <https://www.themoscowtimes.com/2020/07/03/russia-touts-s-500s-ability-to-destroy-hypersonic-weapons-in-space-a70767#:~:text=Russia's%20advanced%20S%2D500%20air,and%20space%20forces%20has%20said.&text=President%20Vladimir%20Putin%20has%20said,high%20altitudes%20including%20near%20space.%E2%80%9D>.

<sup>25</sup> 2010 Nuclear Posture Review (NPR) Fact Sheet", Dod.Defense.Gov, April 2010, [https://dod.defense.gov/Portals/1/features/defenseReviews/NPR/NPR\\_FACT\\_SHEET\\_April\\_2010.pdf](https://dod.defense.gov/Portals/1/features/defenseReviews/NPR/NPR_FACT_SHEET_April_2010.pdf)

<sup>26</sup> A Budget for A Better America", U.S. Government Publishing Office, March 2019, <https://www.whitehouse.gov/wp-content/uploads/2019/03/budget-fy2020.pdf>

<sup>27</sup> A Budget for A Better America", U.S. Government Publishing Office, March 2019, <https://www.whitehouse.gov/wp-content/uploads/2019/03/budget-fy2020.pdf>

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government consortium has been created to develop an integrated roadmap for future hypersonic weapons.<sup>28</sup>

The US is embarked upon developing different variants of hypersonic missiles and their supporting technologies. In March 2020, the US tested hypersonic glide vehicle C-HGB (Common-Hypersonic Glide Body) and then in August 2020, the US Air Force conducted a successful flight test of a tactical boost-glide (TBG) technology on B-52 to test AGM-183A missile, which is a part of an Air-launched Rapid Response Weapon (ARRW) program.<sup>29</sup> The US army and the navy are also working on Long Range Hypersonic Weapons (LRHW) and Intermediate-Range Conventional Prompt Strike (IRCPS) system. All these weapon systems would have the option of launching from air, ground or submarines -- to strike targets with conventional warheads at the intermediate ranges.<sup>30</sup>

The US Air Force Nuclear Weapons Center is also exploring the idea of developing HGVs that could fly to ICBM ranges, which could possibly mean that these missiles may be equipped with nuclear as well as conventional warheads.<sup>31</sup> Nevertheless, the US official policy for now remains developing a conventional hypersonic capability, but this might change keeping in view the Russian weapons that are capable of carrying both nuclear and conventional warheads.

The US is also working on technologies that could intercept and destroy hypersonic weapons, but this may take considerable time due to the complexities involved in tracking a missile that could be capable of flying at hypersonic speeds, and maneuver as well. Amongst some of the options that are being considered are improvements in the Conventional

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<sup>28</sup> Rachel S. Cohen, "Congress Endorses Hypersonic Weapons as Development Ramps Up - Air Force Magazine", *Air Force Magazine*, January 02, 2020, <https://www.airforcemag.com/congress-endorses-hypersonic-weapons-as-development-ramps-up/>.

<sup>29</sup> Sommer Brokaw, "U.S. Hypersonic Weapon System Completes Second Test on B-52 Stratofortress", *UPI*, Aug10, 2020, <https://www.upi.com/amp/Defense-News/2020/08/10/US-hypersonic-weapon-system-completes-second-test-on-B-52-Stratofortress/5371597085228/>.

<sup>30</sup> Steve Trimble, "USAF Errantly Reveals Research on ICBM-Range Hypersonic Glide Vehicle", *Aviation Week*, Aug 18, 2020. <https://aviationweek.com/defense-space/missile-defense-weapons/usaf-errantly-reveals-research-icbm-range-hypersonic-glide>.

<sup>31</sup> *Ibid.*

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Prompt Global Strike (CPGS) capability that could target adversary's HGVs in a pre-emptive strike.<sup>32</sup>

The US Defence Advanced Research Project Agency (DARPA) is also working on a counter-hypersonic glide breaker that would enable the interceptors to detect and destroy incoming hypersonic missiles through defence by denial.<sup>33</sup> The US is planning to extend the range of its Terminal High Altitude Area Defence (THAAD) system and Exo-atmospheric interceptors which would provide early warning and facilitate the interception of fast moving HGVs.<sup>34</sup> The US Missile Defence Agency (MDA) is seeking space-based sensors as part of its Hypersonic and Ballistic Tracking Space Sensor (HBTSS) program, to help track all types of missiles, including the hypersonic weapons. These sensors are cost effective, light weight, and replaceable at the end of life and could be placed in the Low Earth Orbit (LEO) initially, and subsequently in the Medium Earth Orbit (MEO), to ensure their survivability against adversary's attempt to blanket or destroy it.<sup>35</sup>

### **China Joining the Hypersonic Race**

China started working on its hypersonic weapons in 2000 and has made significant progress that may have unnerved the US and possibly few other countries. China's current boost-glide vehicle DF-17 or DF-ZF which was displayed in a military parade in 2019, is a medium-range ballistic missile that can go up to 2500 km and attain a speed of Mach 10.<sup>36</sup> China is also working on Xingkong-2 'wave rider' - a hypersonic

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<sup>32</sup> Debalina Ghoshal, "Playing Catch Up: How the U.S. Plans to Counter Hypersonic Missiles", *Defence IQ*, Sep 23, 2019, <https://www.defenceiq.com/air-land-and-sea-defence-services/articles/playing-catch-up-how-the-us-plans-to-counter-hypersonic-missiles>.

<sup>33</sup> Ibid.

<sup>34</sup> Tamir Eshal, "US Considers Extended Range THAAD, Enhanced BMS To Defend Against Attacking Hypersonic Gliders," *Defense Update*, Jan 09, 2015, [https://defense-update.com/20150109\\_us-considers-extended-range-thaad-enhanced-bms-hypersonic-to-defend-against-attacking-hypersonic-gliders.html](https://defense-update.com/20150109_us-considers-extended-range-thaad-enhanced-bms-hypersonic-to-defend-against-attacking-hypersonic-gliders.html).

<sup>35</sup> Douglas M. Fraser, Frank Gorenc and John S. Shapland, "Hypersonic Defense Requires Getting Space Sensor System Right", *Realcleardefense.Com*, May 13, 2020 [https://www.realcleardefense.com/articles/2020/05/13/hypersonic\\_defense\\_requires\\_getting\\_space\\_sensor\\_system\\_right.html](https://www.realcleardefense.com/articles/2020/05/13/hypersonic_defense_requires_getting_space_sensor_system_right.html).

<sup>36</sup> Missile Threat: CISS Missile Defense Project. <https://missilethreat.csis.org/missile/df-17/>.

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cruise missile since 2018, but there is little information available about its further specifications.<sup>37</sup>

Chinese hypersonic achievements have emerged as a more serious challenge for the US military strategy in Asia-Pacific and for its regional allies. From 2008 to 2015, China conducted hypersonic technology tests twenty times more than what the US did in the same period.<sup>38</sup> China is also making substantial progress in developing a scramjet engine for the hypersonic cruise missiles. As per the reports, the developed prototype initially covered 600 seconds in its ground tests which is considered a milestone in the HCM development.<sup>39</sup>

China is using hypersonic weapons as an anti-access area denial (A2/AD) tool in order to prevent the US from any attacks and to deter its missile defences in the Asia-Pacific theatre.<sup>40</sup> The 3D Strategy (Dissuade, Deter, and Defeat) employed by the People's Liberation Army (PLA) against the US and its allies has raised serious concerns for the Pentagon, and may have complicated the US ability to provide precise warning.<sup>41</sup> The annual report to the Congress also admitted that China is ahead of the US in various technological aspects, such as hypersonic weapons and land-based ballistic and cruise missiles.<sup>42</sup>

#### **UK's Attempt to Remain Relevant**

To remain a relevant global military power, the UK has joined the hypersonic missile race and has allocated around £12 million for research

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<sup>37</sup> Xuanzun Liu, "China's hypersonic cruise missile sees technological breakthrough: reports", *Global Times*, 2020, <https://www.globaltimes.cn/content/1190877.shtml>

<sup>38</sup> James Grant, "America's Military Has A Problem: Russia And China Are Building Hypersonic Weapons | American Foreign Policy Council", *Afpc.Org*, 2020, <https://www.afpc.org/publications/articles/americas-military-has-a-problem-russia-and-china-are-building-hypersonic-weapons>.

<sup>39</sup> Xuanzun Liu, "China's hypersonic cruise missile sees technological breakthrough: reports", *Global Times*, June 8, 2020, <https://www.globaltimes.cn/content/1190877.shtml>

<sup>40</sup> Mike Yeo, "China's Missile and Space Tech Is Creating a Defensive Bubble Difficult to Penetrate", *Defense News*, Jun 01, 2020, <https://www.defensenews.com/global/asia-pacific/2020/06/01/chinas-missile-and-space-tech-is-creating-a-defensive-bubble-difficult-to-penetrate/>.

<sup>41</sup> "Defense Primer: Hypersonic Boost-Glide Weapons", *Congressional Research Service* (CRS), Mar 13, 2020. <https://fas.org/sgp/crs/natsec/IF11459.pdf>.

<sup>42</sup> "Military And Security Developments Involving the People's Republic of China 2020", *Media.Defense.Gov*, 2020, pp 53 <https://media.defense.gov/2020/Sep/01/2002488689/-1/-1/1/2020-DOD-CHINA-MILITARY-POWER-REPORT-FINAL.PDF>.

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and development. As per the existing plans, the development of hypersonic propulsion systems could be completed in the next two years.<sup>43</sup> The Project Tempest, which is being developed, is likely to be completed in 2030s with a futuristic fighter carrying laser and hypersonic weapons. Unlike the other main players, UK may find it difficult to justify its heavy investments in the field of hypersonic as it does not face any direct challenge to its security from any of the global powers.

Country	Hypersonic missile type/Class	Launch Platform	Speed	Range	Warhead	Development Phase
Russia	Yu-74 Avangard / HGV	SS-19 Stiletto ICBM, may be later replaced by R-28 Sarmat	Up to Mach 27	6,000 km	Conventional and Nuclear Capable	Developed and Operationalised
	KH-47M2 Kinzhal/ Air Launched Ballistic Missile	MiG-31	Mach 10	1,500-2,000 km	Conventional and Nuclear Capable	Developed, operationalised
	3M-22 Tsirkon (Zircon), HCM	Yasen Class submarines and Lider Class nuclear destroyer, land platform	Mach 9	≈1,000 km	Not Specified	To be put in service by 2023
U.S	Common Hypersonic Glide Body – Prototype, HGV	Tested from Ohio Class Submarine	More than Mach 5	Not Specified	Conventional and Nuclear Capable	Under Development

<sup>43</sup> Chuter Andrew, “British Military scrambles to Speed up Work on Hypersonic Engines, Weapons”, *Defense News*, Jul 18, 2019, <https://www.defensenews.com/global/europe/2019/07/18/british-military-scrambles-to-speed-up-work-on-hypersonic-engines-weapons/>.

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	AGM-183A Air-launched Rapid Response Weapon (ARRW), long-range hypersonic boost-glide vehicle	B-52 or for future on F-15EX	Not Specified	Not Specified	Conventional	Under development, to be completed in 2022
<b>China</b>	Dong Feng-17, MRBM, HGV	ICBM	Mach 5-10	1800-2500	Conventional and Nuclear Capable	Developed, Operational
	Xingkong-2 or Starry Sky-2, waive rider hypersonic flight vehicle	unspecified	<Mach 5	unspecified	unspecified	Tested
<b>India</b>	BrahMos – II/ HCM	Aircraft, Land, Submarine, Ship	Mach 7	450 - 600	Not Specified	Under Development, To be put in service by 2025
	Hypersonic Technology Demonstrator Vehicle (HSTDV)		< Mach 5	Not specified	Not Specified	Tested Successfully <sup>44</sup> <sub>45</sub>

### **Hypersonics in South Asia and Implications for Regional Stability**

The ongoing arms race between the major powers also affects regions like South Asia, which is emerging to be the epicenter of the new Cold War. With China building its economic and military muscles and the US attempting to contain its rise with the help of regional powers like India, there is a greater possibility that the two South Asian adversaries could be pushed towards another cycle of stability-instability, as a result of growing competition between the two global powers.

Hypersonic weapons may have less utility between the two South Asian neighbours due to short flight time of ballistic and cruise missiles

<sup>44</sup> “India successfully test-fires hypersonic missile carrier, 4<sup>th</sup> country to achieve the feat”, *The Print*, Sep 07, 2020. <https://theprint.in/defence/india-successfully-test-fires-hypersonic-missile-carrier-4th-country-to-achieve-the-feat/497491/>.

<sup>45</sup> Ibid.,

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that are in their existing inventories. Notwithstanding its limited utility in a peculiar South Asian environment, India is developing hypersonic weapons so as to be recognised as a superior power, and also for using these weapons for offensive counterforce strikes that could have added advantage of creating shock and awe.

The recent test of India's indigenously developed Hypersonic Technology Demonstrator Vehicle (HSTDV) makes it the fourth country with this technology.<sup>46</sup> India is also developing a variant of cruise missile that has been labelled as Brahmos-II which would have speed more than Mach-5 and an estimated range of 450-600 km. The earlier version – the BrahMos-I was jointly produced with Russia. It is quite likely that the new variant may also have been developed with the Russian assistance.

Hypersonic weapons could have an advantage against missile defences due to their speed and maneuverability but none of India's two adversaries, i.e. Pakistan or China, have demonstrated any serious interest in developing a missile shield. In the absence of a missile defence system in the neighbourhood, it becomes difficult for India to justify its case for hypersonic weapons, other than to demonstrate India's technological credentials. China has acquired S-400s anti-missiles system from Russia essentially to counter the emerging security concerns from the US, since it does not consider India to be a major threat that could merit significant attention. India's western neighbour has also not demonstrated any interest in building a missile shield for lack of its utility in a peculiar regional environment where missiles flight time is already too short, and also because these are technologically and economically difficult targets to acquire.

India, nevertheless, could be building hypersonic weapons for three possible scenarios. One, it could use these missiles for launching limited strikes against Pakistan. This would preclude the possibility of losing a manned aircraft as was the case in February 2019 surgical strike, when India lost two of its aircraft causing significant blow to its military prestige.

The second scenario could be the use of hypersonic weapons to launch counterforce strikes and creating 'shock and awe' impact. Such a

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<sup>46</sup> "India successfully test-fires hypersonic missile carrier, 4<sup>th</sup> country to achieve the feat", *The Print*, Sep 07, 2020. <https://theprint.in/defence/india-successfully-test-fires-hypersonic-missile-carrier-4th-country-to-achieve-the-feat/497491/>.

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strike would push the other side to retaliate with full force that may eventually cause more damage than the envisioned gains. A third scenario, which seems more plausible, could be to develop a counterforce strike capability and use it as a deterrent and to prevent Pakistan from the early deployment of its tactical nuclear weapons, which, from the Indian perspective, could offer space for its Cold Start Doctrine (CSD).<sup>47</sup>

These concerns gain more credibility in view of the statements made by senior members of India's Nuclear Command Authority that has raised serious questions about India's 'No First Use' posture<sup>48</sup> and the possibility that India may be contemplating a 'preemptive counterforce strike' against Pakistan.<sup>49</sup>

Hypersonic weapons are known to be more effective against mobile ground-based nuclear forces that are otherwise difficult to target by less agile missiles.<sup>50</sup> Due to their high speed, hypersonic missiles can reach the target within few minutes before the mobile launchers could be displaced from their locations. This may leave little or no option for the adversary than to move towards a pre-delegation of launch authority or adopt a launch-on-warning posture. Increasing the numbers could be another option to enhance the survivability of strategic forces.<sup>51</sup> All of these responses would be destabilising and could have serious implications for strategic stability in the region.

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<sup>47</sup> Cold Start Doctrine (CSD) was introduced by India in 2004 to fight a limited conventional war in a nuclearised environment by exploiting space below Pakistan's perceived nuclear threshold. For details see, Adil Sultan, "Pakistan's emerging nuclear posture: impact of drivers and technology on nuclear doctrine". [http://iissi.org.pk/wp-content/uploads/2014/06/1340000409\\_86108059.pdf](http://iissi.org.pk/wp-content/uploads/2014/06/1340000409_86108059.pdf)

<sup>48</sup> Adil Sultan, "The Controversy Surrounding India's Nuclear NFU Posture!" *Strafasia* Aug 20, 2019. <https://strafasia.com/the-controversy-surrounding-indias-nuclear-nfu-posture/>

<sup>49</sup> Samran Ali, "India's Growing Counterforce Capabilities," *Strafasia* Jun 8, 2020. <https://strafasia.com/indias-growing-counterforce-capabilities/>

<sup>50</sup> "Hypersonic weapons and strategic stability", *Strategic Comments*, International Institute for Strategic Studies (IISS), volume 26, Mar 04, 2020. <https://www.iiss.org/~publication/23a21359-6cb1-4355-b6be-f6aba4a5c1e9/hypersonic-weapons-and-strategic-stability.pdf>

<sup>51</sup> Richard H. Speier et al., "U.S.-Russia-China Cooperation Could Hinder the Proliferation of Hypersonic Missiles", RAND Corporation, 2019, [https://www.rand.org/pubs/research\\_reports/RR2137.html](https://www.rand.org/pubs/research_reports/RR2137.html)

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



Source:  
Illustrated by the Authors

### Options for Pakistan

India’s ongoing efforts to develop anti-ballistic missile system, its sea-based second-strike capability, and introduction of new concepts of fighting a limited war under a nuclear overhang -- are viewed by Pakistan as part of a plan to shift strategic equilibrium in India’s favour, thus forcing it to develop responses that could help restore the balance.

These swings of “instability-stability pendulum”<sup>52</sup> driven by action-reaction syndrome continue to strain the South Asian strategic stability, and these trends if remained unchecked, could potentially trigger a serious escalation that may lead to a nuclear exchange. For instance, India may be developing hypersonic weapons to keep the option of counterforce strike, but may not necessarily be intending to actually launch such a strike

<sup>52</sup> Lt Gen (Retd) Kidwai explained this in his speech delivered at the IISS London, Feb 7, 2020. For full text of his speech see, <https://strafasia.com/gen-kidwai-speech-iiss-ciss-workshop-london-6-february-2020/>.

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against Pakistan. The acquisition of a counterforce capability itself could push Pakistan to take counter measures so as to retain the credibility of its deterrence posture. Some of these measures could potentially include putting its missiles on a higher alert status to avoid ‘use-it or lose-it’ dilemma; building hypersonic weapons to provide a tit-for-tat response; re-calibrating the FSD posture; enhancing the size and the mobility of its arsenal; and fast-tracking the development of second-strike capability to provide assured response. These measures that may appear defensive in nature and justifiable for one party could be interpreted differently by the other side and may continue to disturb instability-stability pendulum.

#### **Building own Hypersonic Weapons?**

Pakistan can start its own hypersonic weapons program to provide a ‘tit-for-tat’ response in case India decides to launch a counterforce strike by using its conventionally tipped hypersonic weapons. This may trigger a new competition in the hypersonic field that Pakistan may find difficult to sustain. This may lead to a more serious and undesirable outcome as India might find incentive to launch a counterforce strike, assuming that Pakistan will not respond with nuclear weapons early in a conflict. Such a perception, if allowed to permeate could adversely impact Pakistan’s deterrence posture.

In case Pakistani decision-makers decide not to use nuclear weapons in response to a conventional hypersonic strike and instead opt for a conventional counter strike, to avoid crossing the nuclear threshold, they may do so by using cruise missiles instead of developing a hypersonic response. Pakistan’s cruise missiles are capable of penetrating the Indian missile defences and reach their targets with greater accuracy. The supersonic cruise missile being developed by Pakistan Navy could be one such option as it has the ability to target moving warships.<sup>53</sup>

#### **Recalibrating the FSD**

Pakistan’s FSD posture was first introduced in 2011. It was meant to deter the entire spectrum of threats ranging between limited military conflicts to

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<sup>53</sup> Samran Ali, “Assessing the Implications of India’s Hypersonic Technology Test for Pakistan”, Centre for Strategic and Contemporary Research (CSCR), Sep 11, 2020. <https://cscr.pk/explore/themes/defense-security/assessing-the-implications-of-indias-hypersonic-technology-test-for-pakistan/?fbclid=IwAR2v7XP0SfCDbx1uyMXHr7t5vjBLC89SBbZgpXcuxBciRrXAKIJOHF3QnZO>.

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an all-out war. Over the past decade, FSD seems to have undergone some transformation as is reflected in the statements made by the senior military leadership. Speaking at the IISS London, the former Head of Pakistan's Strategic Plans Division (SPD), Advisor to the National Command Authority (NCA), Lt Gen Khalid Kidwai (Retd), described FSD as a comprise of “ large variety of strategic, operational and tactical nuclear weapons, on land, air and sea, designed to comprehensively deter large scale aggression against mainland Pakistan.”<sup>54</sup> This could be interpreted as deterring ‘only’ the large-scale aggression and not necessarily the limited wars, and, therefore, may need clarity to avoid misinterpretation by the other side.

If the earlier interpretation of FSD posture was meant to deter the entire spectrum of threats (limited to an all-out war) then Pakistan must signal its willingness to retaliate with full force, which may include the possibility of counter-value targets, in case the other side attempted to neutralise its strategic forces through hypersonic strikes.

### **Enhancing Mobility and Survivability of SRBMs**

Pakistan's SRBMs have a ‘shoot and scoot’ capability that allows better mobility against an incoming strike from the adversary. Pakistan could, nevertheless, 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, especially if the adversary mistakenly assumes that the missiles deployed by the other side are armed with conventional warheads and decides to launch a preemptive strike.

### **Develop an ASAT Capability**

Hypersonic weapons are quick reaction force that is most effective once used in conjunction with the latest information about adversary's deployment pattern. India has number of surveillance satellites and has also signed agreement with the US on the information sharing. The Communications, Compatibility and Security Agreement (COMCASA) gives the Indian military access to secure common tactical picture,

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<sup>54</sup> “Pakistan's Policy of ‘Quid Pro Quo Plus’: Remarks by Lt Gen Khalid Kidwai (Retd) at the IISS London”, Feb 7, 2020. <https://strafasia.com/gen-kidwai-speech-iiss-ciss-workshop-london-6-february-2020/>.

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allowing its Navy and Air Force to receive data from the US during exercises and actual operations.<sup>55</sup>

In a future conflict with Pakistan, India could gather highly accurate picture of the adversary's deployments through its own satellites or through the US space based assets. It may then use it for a preemptive counterforce strike against Pakistan with or without the US knowledge. The US is unlikely to willingly allow India to launch a counterforce strike against Pakistan based on the information exchanged as part of the new arrangement between the two countries. However, to deter India from contemplating such a strike, Pakistan could develop its own anti-satellite weapons, primarily as a deterrent and to deny the other side the misuse of space-based assets against Pakistan's nuclear weapons.

#### **Consolidating the Second Strike Capability**

The surest way to deter the adversary from contemplating a preemptive first strike by using nuclear or conventionally tipped hypersonic weapons would be to consolidate a second-strike capability. It could promise an assured response. Pakistan's current sea-based nuclear deterrent, which includes Babur cruise missile, has a range of 450 km. The missile incorporates certain stealth technologies, terrain hugging and sea skimming flight capabilities and can carry various types of payloads,<sup>56</sup> but it does not have the desired ranges to cover the entire Indian landmass. To deter India from contemplating even a limited strike, Pakistan may need to increase the ranges of its cruise missiles that could reach major Indian cities and prevent India from contemplating a preemptive counterforce strike in the first place.

#### **Conclusion**

Due to the complexities [this word better describes the problems associated with this technology. It is not only the high cost but technical issues as well] involved in the development of hypersonic weapons, this relatively new technology remains a privilege for mainly rich countries.<sup>57</sup>

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<sup>55</sup> Ankit Panda, "What the Recently Concluded US-India COMCASA Means", *The Diplomat*, Sep 09, 2018. <https://thediplomat.com/2018/09/what-the-recently-concluded-us-india-comcasa-means/>.

<sup>56</sup> Inter Services Public Relations (ISPR), Press Release, Jan 9, 2017, [https://www.ispr.gov.pk/front/main.asp?o=t-press\\_release&date=2017/1/9](https://www.ispr.gov.pk/front/main.asp?o=t-press_release&date=2017/1/9).

<sup>57</sup> "Hypersonic Weapons: Can Anyone Stop Them?" *Airforce Technology*, Oct 16, 2018, <https://www.airforce-technology.com/features/hypersonic-weapons-can-anyone-stop/>.

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For now, only four countries (US, Russia, China, UK and India) have demonstrated their capabilities or the potential to build hypersonic weapons; however, as the technology becomes more accessible there could be several others joining the hypersonic club, either for prestige or security considerations.

The development of hypersonic weapons will have most pronounced impact on a region like South Asia, where its employment and use could compress Pakistan's OODA cycle and provide incentive to the Indian decision-makers to contemplate a preemptive first strike. Under normal circumstances, no rational decision-maker would venture on such a suicidal mission. Nonetheless, there is a possibility that driven by the wave of 'militant nationalism,' the current Indian political leadership could possibly contemplate a preemptive counterforce strike against Pakistan.

Oblivious to these dangers, some of the major powers are helping India to build its hypersonic capabilities mainly for their own strategic and commercial interests. This would have adverse implications for crisis stability in the region. In response, Pakistan is likely to develop options that may push the region towards a renewed military competition thus further complicating the regional security matrix.

To prevent both India and Pakistan from indulging in a new arms race, there is a need to encourage both adversaries to resume their dialogue process and negotiate new confidence building measures. Some of these measures could include banning or limiting the development of hypersonic weapons or declaring moratorium on further testing of these weapons. India, which sees itself at an advantageous position, is unlikely to engage in a bilateral arrangement with Pakistan. It could also insist on the inclusion of China in a trilateral process. This strategic chain, where India links its action to China, and China to the US, has emerged as a major impediment in the normalisation or the start of a CBM process between India and Pakistan.

Hence the hypersonic weapons -- that India is in the process of developing -- are likely to be employed against Pakistan while most certainly impacting the strategic stability in the region adversely. Looking at the past, it is evident that Pakistan has never allowed the imbalance to perpetuate for a prolonged period. It would rather develop options that could help restore the strategic balance. This may come at a greater cost

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and at the risk of a new arms race in South Asia, which none of the two regional powers can afford.■