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HYPERSONIC WEAPON SYSTEMS – A NEW WAVE OF ARMS RACE IN THE INDIAN OCEAN REGION

Imran Raza and Nasir Mehmood[*]

Abstract

Technological advancements and tactical applications have always played a significant role in determining the outcomes of military conflicts. The emergence of Hypersonic Weapon Systems is considered a game-changer in contemporary and future warfare, as it can potentially dominate the early stages of conflict. Major powers like the US, China and Russia are pursuing technological superiority by developing hypersonic weapons, which could undermine conventional strategic capabilities and render even the most advanced air and missile defences obsolete. However, there has been limited discussion on the impact of deploying hypersonic weapons in the Indian Ocean region and its implications on strategic stability in the Pakistan-India military matrix. This paper examines the induction of hypersonic weapons by the Indian Navy, utilising insights from security dilemma and conventional deterrence theories to navigate the complex strategic landscape in the region. It contributes to the ongoing debate on the relationship between the arms race and conventional deterrence in Pakistan and India, highlighting the risks of an arms race in the Indian Ocean region. Without strategic dialogue on regulating hypersonic weapons systems, the chances of escalation and conflict could increase significantly.

Keywords: Strategic Balance, Hypersonic Weapon Systems, Deterrence, South Asia, Indian Ocean.

Introduction

Throughout the history of warfare, there has always been a strong link between combat superiority and innovation and advancement in military technology.[1] Military history attests to the fact that armed forces' success in combat largely depends on their technological superiority and ability to employ it effectively. The character of war, both in the past and present, has evolved alongside advances in military technology.[2] It becomes the raison d'etre of armed forces to outmatch an adversary's technological advancements. Among these technological advancements, the ability of vehicles to travel at a hypersonic speed ranging from Mach 5 to as much as Mach 25 has gained prominence in contemporary warfare. These weapons are commonly known as Hypersonic Weapon Systems (HSWs).

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The origins of hypersonic technology can be traced back to the 1930s. However, in the last two decades, the capability of reliable, sustained hypersonic flight has truly come to fruition. The emergence of HSWs is a game-changer, as it has the potential to undermine conventional strategic capability and render the most advanced air and missile defences obsolete. By being able to outmanoeuvre and deceive air defences, hypersonic technology can compress an adversary's reaction time, thereby promoting an element of surprise and uncertainty. The speed and precision of HSWs have, in fact, serious implications for the Observe-Orient-Decide-Act (OODA) loop.[3]

In the quest for strategic superiority, various technologically advanced states, including the US, China, and Russia, have emerged as front-runners in developing and deploying hypersonic weapons. Inspired by the successes of these leading states, other nations such as France, Germany, the UK, and India are now venturing into this field. The introduction of hypersonic weaponry into the Indian Ocean theatre by China and India is anticipated to transform the very nature of conventional warfare. It will push other South Asian states to either improve their technology to defend against hypersonic weapons or to develop similar weapons to maintain a military balance.[4] However, this could trigger an arms race in the Indian Ocean region, increasing the risks of escalation and conflict.

Theoretical Construct

The conceptual underpinnings of the security dilemma and conventional deterrence provide a general foundation for this study. Central to the security dilemma is the notion that measures taken by one state to bolster its security can cause insecurity in other states. John Herz, a renowned American political scientist, initially articulated this phenomenon in the 1950s.[5] The security dilemma can manifest in various ways, whether through deploying nuclear weaponry or pursuing superiority in conventional arms. Many commentators on international relations believe that the security dilemma is a significant source of an arms race and eventual conflict between states. As the international system remains anarchic with higher risks of inter-state violence, states must prioritise their security and survival by maximising resources. However, the pursuit of state-of-the-art weaponry and technological superiority, intentionally or unintentionally, undermines the security of other states. Resultantly, the state, deficient in high-tech weapons against its adversary, will try to follow suit to maintain balance, igniting a domino effect of security spirals between rival nations. As per the classical definition, a security spiral represents a chain reaction in which two rival states become tied in an arms race, escalating tensions and conflict.

With states indulging in an arms race, achieving a balance among their forces is unachievable. Out of the two involved parties, there would always be a superior one; thus, the constant efforts on both sides to upgrade their forces never end. The arms race is an idea inextricably linked to the importance of the number and types of weapons in an anarchic international environment. Unlike the incessant arms race,

conventional deterrence is a critical function of a state's military capabilities in preventing and containing military attacks from escalating into devastating all-out wars. Concerning nuclear-capable states, the primary purpose of conventional deterrence is to prevent the use of nuclear weapons and deny the aggressor's battlefield objectives by leveraging credible conventional means. It entails using available weaponry and military strategy to deter and dissuade any potential adversary from launching aggressive military attacks.

John Mearsheimer has provided a comprehensive perspective on the concept of conventional deterrence, wherein he explains that it is aimed at denying the combat objectives of adversaries. He also emphasises that conventional deterrence encompasses not only numbers and types of weapons but also depends on military strategy and political considerations. The main objective of conventional deterrence is to buy time in battle and delay the enemy from achieving a quick victory.[6] It is predicated on the premise that conventional deterrence creates a belief among adversaries that a rapid and decisive victory is impossible. Conventional deterrence often advocates for a negotiated balance of forces to maintain peace and stability. It dictates equality between opposing forces, as asymmetry can incentivise superior forces to escalate the conflict. In contrast, the balance of forces reinforces stability by creating fear of retaliation. In addition to numerical balance, technological parity is a critical aspect of conventional deterrence. In a nutshell, states must develop force equilibrium in quantity and quality to enhance strategic stability. It implies that conventional deterrence is a continuous intelligent undertaking to keep up with evolving threats and emerging technologies.

Herman Kahn, a renowned strategist, once expounded on the escalation ladder and highlighted that the primary restriction to escalation is the apprehension of the adversary's reaction rather than the desirability of action.[7] Moreover, if a significant gap exists between the conventional forces of two nuclear rivals, this gap will probably be filled with nuclear capabilities. Hence, conventional deterrence can exist between nuclear and non-nuclear rivals. Nevertheless, if conventional deterrence between nuclear powers is not managed adeptly, there is a risk of war under a nuclear hangover. Given this, the presence of conventional weapons in addition to nuclear arsenals can effectively enhance the deterrence mechanism between nuclear states, thereby strengthening the existing deterrence matrix.

While acknowledging the devastating effects of nuclear weapons, few conventional weapons possess the potential to significantly upset the balance of power between nuclear and non-nuclear rivals. One such weapon, which has received much attention, is HSWs. These weapons are characterised by unparallel speed, reach and precision. Hypersonic weapons allow nuclear rivals to engage in aggressive actions without crossing the threshold. HSWs can inflict catastrophic damage at the initial battle stage by obliterating the enemy's early warning and air defence mechanisms. Therefore, using these weapons is a simple way to put the adversary in a state of quandary.[8] By disabling the eyes and ears of a force right from the outset of a conflict,

HSWs create a situation where open hostilities at sea become inevitable. However, the most perilous situation arises when these early warning systems and high-value assets are linked to a state's nuclear warning system. In such a scenario, employing HSWs by one side could potentially trigger a nuclear war between two rivals. Hence, the provision of HSWs by one state can dilute the prevailing strategic stability between two nuclear-capable states. Now a fundamental question arises: what will the effect of the induction of HWSs in South Asia be? Will employing HSWs in the Indian Ocean lead to an arms race in the region? This paper argues that India's induction of HSWs will likely induce an arms race in the Indian Ocean region.

The deployment of HSWs by India in the region raises concerns that other rival states may feel compelled to match this capability. Hence, it is imperative to critically analyse the deployment of HSWs in the Indian Ocean region, hypothesising that it could lead to an arms race. This paper dilates on a few fundamental issues that need to be addressed, such as how states are pursuing the development of HSWs at the global and regional levels, the effect of HSWs on the strategic stability between two nuclear rivals, the evolution of the security calculus in the Indian Ocean region with India's HSWs, and whether the pursuit of HSWs could trigger an arms race at the regional level. Additionally, it examines the available options for Pakistan to mitigate the threat posed by HSWs.

The pursuit of HSWs by various states has sparked debates among strategists and analysts from different regions and cultures. Regrettably, there is no serious discussion on the role of HSWs in the onset of an arms race in the Indian Ocean region. It is worth recalling that Pakistan and India, as littoral states of the Indian Ocean, possess nuclear capabilities and have long-standing rivalries. Therefore, any technological dominance achieved by India would require a counterbalance from Pakistan to maintain strategic equilibrium in the region. Indian Ocean region, being the global common, is a lifeline for many littorals because of their dependence on sea routes. A smooth and steady energy flow in the Indian Ocean favours many global and regional players. Hence, a balance of power must prevail in the Indian Ocean for the smooth and safe flow of energy, mainly from the Middle East to the various East and West destinations. Any technological advancement that can disturb the balance in the region is expected to initiate an arms race.

Main Discussion

As per the classical academic definition, hypersonic vehicles are those vehicles or weapons which are having capabilities to travel more than Mach 5 (five times higher than the speed of sound); with this speed, the weapon or vehicle can cover almost 3,400 miles in an hour and if we look further deep almost more than a mile in one second. The higher end of this technology covers speeds up to Mach 25, and this high-speed weapon can cover almost 17500 miles in an hour and nearly 5 miles in a second.[9] HSWs are predominantly different from space re-entry vehicles because the former is designed to fly at hypersonic speeds for sustained periods and

are potentially manoeuvrable throughout their flight. At present various forms of hypersonic weapons are in use. Each has different characteristics as per its military application.

States awestruck with military ascendancy through technological development are developing and deploying HSWs on the battlefield to have the edge over their adversaries. From a historical perspective, during the Cold War era, the US and the USSR commenced research to develop manoeuvrable re-entry vehicles for ballistic missiles; however, HSWs entered services from both sides in the 21st century. Currently, the US is leading in developing HSWs as the state has produced a broad range of sophisticated advanced state-of-the-art hypersonic systems and is still producing new versions of HSWs. The US recently awarded a contract to manufacture AGM-183A hypersonic, primarily a launched response weapon system and conventional strike weapons.[10] Matching the suite of technological advancement, Russia has also inducted various surface-launched hypersonic weapon systems, including Zircon, U-71 and BrahMos II.

Similarly, Russia has also inducted an air-launched ballistic missile system Kh-47M2 (Kinzhal), capable of attaining Mach 10 speed and a range of about 1700 nms. In the maritime arena, Russia has developed 3K22 Tsirkon HSWs with a speed of up to Mach 6 and a range of up to 620 miles. Russia has also launched the Avangard Hypersonic glide vehicle system. China, the upcoming global power, has also ventured into the field of HSWs through several surface, sub-surface and air-launched projects. China has tested DF-17 along with Ling Yun, a scramjet-powered missile. The Chinese DF-ZF is a hypersonic missile glide vehicle on the naval side. In addition, China has successfully fired the Starry Sky-2 hypersonic vehicle with a max speed of up to Mach 6.[11] European states are also developing HSWs as, for decades, both UK and France have been co-developing a hypersonic missile Perseus, a naval variant expected to replace existing subsonic missiles. Perseus is expected to enter service in the coming year.[12] In South Asia, India has stepped into the race of HSWs by testing its indigenously built Hypersonic Technology Demonstrator Vehicle (HSTDV) in September 2020.[13] Through a joint venture, India has also produced a BrahMos-II missile capable of attaining speed up to Mach 5. India has also ventured into selling its hypersonic weapon to other Southeast Asian states, including the Philippines and Thailand, which may lead to serious repercussions.

Impact of HSWs

The appearance of HSWs is generally accepted as one of the critical challenges to strategic stability between nuclear-capable states. Due to extraordinary speed with pinpoint accuracy, HSWs offer unique advantages to a side having these weapons. HSWs with more than 5 Mach speed can change their track during flight path, hence creating a decision dilemma on the receiving end.[14] With all these capabilities, HSWs have the potential to disrupt existing strategic stability between nuclear-capable states seriously. Resultantly, relationships between nuclear-capable

states will weaken due to blur lines between conventional and nuclear war fighting. HSWs are considered the most lethal weapons in the inventory of conventional warfare due to various peculiar capabilities, which include:

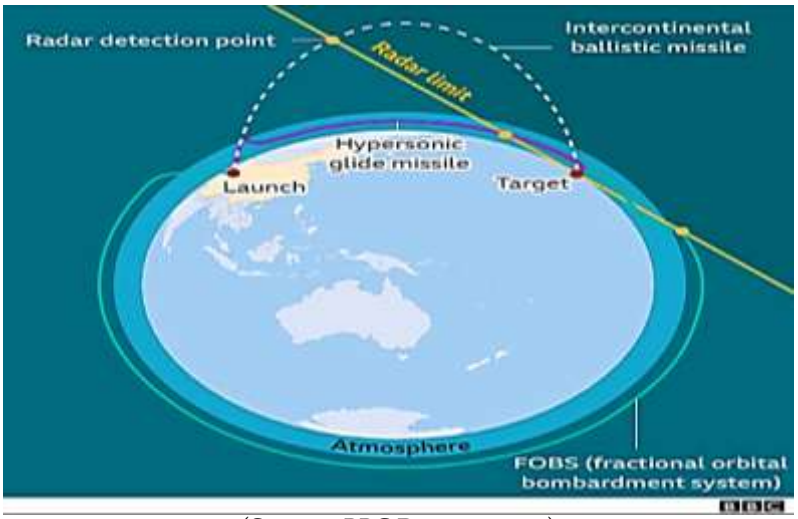
a) **Piercing Capability**

Taking on an adversary's defensive system is vital for an early advantage in warfare. It can only be achieved if the weapon used has sufficient penetrating power and ability to destroy the defence systems. HSWs have these capabilities because these weapons are difficult to detect due to stealthy features, difficult to track due to high Electronic Countermeasure (ECM) features, high manoeuvrability and unpredictable flight trajectory due to high speed and high altitude. Even after detection, it is challenging to respond quickly to HSWs because it gives less reaction time to an adversary as the missile is moving with Mach 6 speed and above.

b) **Standoff Capability**

HSWs are generally launched from far distances because, with high speed, these weapons can travel considerable distances, i.e., more than 1000 Km. Hence, with this standoff range, it is difficult for adversaries to detect launching platforms and take appropriate actions to counter these weapons. Similarly, the launching platform is not required to be close to the target, thereby reducing its detection and neutralisation chances. This capability has completely removed the concept of frontline and rear areas of the battlefield. HSWs can also avoid adversaries' radar detection. Any prime target, including national leadership, strategic command and control centres, and economic hubs, can be easily targeted with HSWs, creating enormous psychological pressure on the adversary during combat.

Figure 1: Hypersonic Missiles vs Ballistic Missiles - Radar Detection



(**Source**: BBC Documentary)

It indicates that hypersonic missiles can avoid radar detection. The white dotted line indicates the ballistic missile trajectory, the brown line indicates radar coverage, and the red line indicates the hypersonic missile's path. A ballistic missile comes earlier in radar coverage than a hypersonic weapon as it follows earth curvature.

c) **Crises Signalling**

As the trajectory of HSWs is closer to space, these weapons can also be used for strategic signalling without violating the adversary's space. Therefore, firing these weapons during a crisis can cause maximum deterrence in the opponent's mind.

d) **Cost Effectiveness**

HSWs are quite cost-effective compared to other alternate conventional strike systems because conventional ballistic weapons of the same range are considered more expensive than HSWs. For short-range conventional weapons, forward bases are required as a launch pad, which becomes more costly than HSWs.

HSWs in the Indian Ocean Region

Weapons are generally designed for both scenarios, i.e., offensive and defensive utility. Similarly, HSWs can also be utilised in both ways.[15] In a regional context, these weapons are primarily used in offensive ways to cripple the command-and-control infrastructure of the adversary prior enemy detecting them and deciding to take aggressive action. In the case of defensive usage, these weapons are generally used as an interceptor against high-speed incoming ballistic missiles. When HSWs are used in offensive roles, there is a high risk of rapid escalation of conflict from crises to a full-fledged war, and when used against a nuclear weapon-carrying state, conventional war may translate into a full-blown nuclear war.[16] With the abovementioned discussion, all states pursuing the provision of HSWs are destined to achieve their inimitable strategic purposes. It is also true that states have accelerated their ongoing HSWs programmes to achieve higher progress than their adversaries, resulting in a leap against the rival, and this scenario has given a domino effect to the classic arms race in the domain of HSWs.

Chinese and Indian Hypersonic Missiles at Sea

On the 73rd anniversary, the Chinese Navy showcased its advanced anti-ship missile YJ-21, which can be launched from a surface ship or naval aircraft. The missile can hit a target at a range of 1000 to 1500 Km with a maximum speed of Mach 10. The missile was test fired from a type 055 Renhai Class Cruiser with 112 vertical launch cells that can target the whole Carrier Group as the missile is difficult to intercept.[17] According to media commentary, PLA (N) systematically deploys hypersonic missiles on naval ships, and Type 52D is next in the series. The main characteristics of YJ-21 are as under:

Figure 2: Characteristics of YJ-21 (Anti-ship Missile)

Range	1000-1500 Km
Speed	Up to Mach 10
Type	Missile Battery
Rarity	Epic
Required Player Status	-
Required Player Level	20
Tier	III
Control Type	Manual
Target	Surface
Launching Platforms	Type 055 Cruisers, H-6 Bombers

(**Source:** Compiled by Authors)

As per the Defence Research and Development Organisation (DRDO) claim, on September 7, 2020, India test-fired a hypersonic technology demonstrator vehicle and became the fourth state to have the capability of HSWs. The conducted test attained a maximum speed of Mach 6 for a 22-second flight test at 30 Km. India is currently working to alter its BrahMos missile to attain a maximum speed of Mach 7 and plans to deploy it in the Arabian Sea in early 2024. As per the DRDO statement, BrahMos II is very similar to the Chinese YJ-21, but the main difference between them is that BrahMos II fires two missiles simultaneously, making the missile system more lethal than YJ-21 as it can accentuate the defences of an adversary. However, the accelerating speed of BrahMos II is lesser than Chinese YJ-21.

Figure 3: Characteristics of BrahMos II

Range	Up to 1000 Km
Speed	Up to Mach 8
Type	Missile Battery
Rarity	Epic
Required Player Status	-
Required Player Level	20
Tier	III
Control Type	Manual
Target	Surface
Launching Platforms	Ship, Submarine, Aircraft and Land-based Mobile Launchers

(**Source:** Compiled by Authors)

The continuing arms race between the global powers in the quest for military dominance has also affected regions like South Asia, becoming the next epicentre of another Cold War. A constant rise in the economic graph of China with its Belt and

Road Initiative (BRI) has given impetus to build its military muscles. China is launching new projects to compete or keep the same pace in military technology as the US and Russia. In order to contain China to an acceptable limit, the US is providing substantial military support to different regional players, including India, through bilateral and informal multilateral arrangements. Similarly, Russia is providing military hardware and superior technology to India to regain its economy's downward trajectory. However, the acquisition of new technology by India, like HSWs, has put various other states of South Asia, including Pakistan, in a stability-instability paradox.[18] Hence, this cycle in South Asia will continue and remain alive with the induction of every new weapon system, which can disturb the existing strategic stability in South Asia.

The ongoing race for HSWs in South Asia has the potential to destabilise the region as the acquisition of HSWs can change nuclear deterrence calculation in South Asia, especially when one nuclear state has HSWs, and another does not. At present, as per the speed and trajectory of ballistic missiles, the reaction time between Pakistan and India is about 5-10 minutes, and with the induction of HSWs, this time will be further reduced, thereby increasing the risk of miscalculation between the two nuclear rivals. If HSWs are deployed at sea, it will further complicate the situation as the firing platform may be a sub-surface platform or a small ship that can merge with transiting international merchant shipping. Hence induction of HSWs in the Indian Ocean will formulate new challenges for Pakistan regarding its maritime security. The deployment of HSWs at sea will undermine the existing nuclear deterrence between Pakistan and India, resulting in increased chances of conflict in South Asia. It will not only enhance the offensive capabilities of India against Pakistan hence to counter these cutting-edge capabilities of India, but Pakistan must also have either matching capabilities or strong defences against these missiles. In all cases, whether Pakistan desires to match the capabilities or fortify its defences against incoming threats, it will certainly lead to an arms race in South Asia.

Options with Pakistan

The continuing quest of India to get an edge in the Indian Ocean region through the acquisition of state-of-the-art anti-ballistic missile defence system S-400 from Russia, induction of nuclear missile onboard submarines to have assured second-strike capabilities, formulation of new fighting concept through land fighting doctrine and now the introduction of hypersonic missiles especially at sea has been viewed with grave concern in South Asia. The induction of hypersonic missiles, especially in land-attack mode, can put any adversary in a severe security dilemma. A military buildup of India in the Indian Ocean region seems never-ending because India is trying to match the suit of China, which it considers its prime adversary. In contrast, China matches the capabilities of the US and other global powers, including Russia. In the whole chain, the most affected nuclear-capable state is Pakistan because in matching India, Pakistan might not have the wherewithal like India, yet it has the most significant threat. Hence in this calculation, Pakistan has to navigate carefully and with all

precautions to meet its security requirements. Now what options are available with Pakistan in this scenario are required to be discussed to view Pakistan's response options in the Indian Ocean region.

a) **Matching the Suite**

Response to any emerging technological advancement can be two-fold; either one must have a similar capability to have tit-for-tat or must notch up its defences to counter the technological advancement of an adversary. Now, Pakistan does not have any missile defence system like S-400, so either Pakistan should acquire the S-400 system or build its indigenous hypersonic missile. Acquiring an S-400-type system will require considerable financial resources, but having its hypersonic missile might be a shorter path for Pakistan to match the capability as Pakistan is already building its indigenous missiles, so efforts are required to increase its cruising speed to more than Mach 5. Hence, Pakistan must start work on its hypersonic missiles.

b) **Enhance Defences against HSWs**

The concept of a defence shield at sea against incoming missiles is already in practice by many littoral states. The deployment of HSWs at sea requires a robust missile shield against these weapons, which has increased manifold. Pakistan is an important member of BRI through the China-Pakistan Economic Corridor (CPEC); hence the security of Sea Lines of Communication (SLOC) emanating from terminal ends of CPEC is the joint requirement of all members of CPEC; therefore, member states of CPEC may join to have a joint mechanism to have a defence shield at sea for the security of SLOCs emanating from the terminal end of CPEC.

c) **Capability Enhancement at Sea**

Currently, Pakistan has a sizeable naval force to counter all sorts of aggression at sea; however, the rapid growth of neighbouring states in naval capabilities demands capability enhancement at Pakistan’s end to meet challenges at the conventional war-fighting front.

d) **Enhancement in Regional Cooperation**

The concept of foreign basing has also been adopted by South Asia states, as India has its naval base at Duqm Oman, which provides considerable flexibility to naval forces for its operations. Pakistan being closer to Oman and other Gulf states, must further improve its relations with Middle Eastern states to increase its reach. In this regard, enhanced regional cooperation, through tacit or formal bilateral and multilateral arrangements, is imperative to thwart the technological gap with the adversary.

Conclusion

Throughout the annals of warfare, adversaries have gained combat superiority by judicially fusing advanced weaponry with strategic utilisation. Successful mission accomplishment during combat depends upon the correct employment of armed forces and technologically advanced weaponry to get synergetic effects. The US, China and Russia are acquiring HSWs to seek a technological edge over their adversaries. Similarly, other states like France, Germany and India are venturing into this field. With the induction of hypersonic weapons in South Asia, the security calculus of the Indian Ocean region has obtained a new strategic dimension, leading to an intensified arms race. Given this, Pakistan needs to carefully decide its course to preserve South Asia's strategic stability. Finding viable options that can match India's HSWs capabilities becomes essential for maintaining this delicate equilibrium. Due to Pakistan's constrained fiscal space, it is important to seek an equalising response while staying within the bounds of available resources to prevent the opponent from fully utilising technical advances in its favour.

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