Emerging Technologies and Strategic Stability in the Indian Ocean Region

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Abstract

The 4th Industrial Revolution (4IR) is the fastest-growing global phenomenon and its developments are alarming. The latest technologies have the potential to disrupt, enable, and act as a force in multi-domains, impacting strategic stability. While strategic stability is predicated on deterrence which is rooted in realism, emerging technologies call for complex interdependence to ensure perfect deterrence. The Indian Ocean Region (IOR) is the most important zone where the manifestation of this transformation in strategic thought is amply visible. This paper identifies the effect of emerging technologies on the strategic stability of three main players of IOR; China, India, and Pakistan.

Keywords: Strategic Stability, Competing Strategies, China, Pakistan, India, Emerging Technologies, IOR.

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Introduction

Because war in space and cyberspace cannot be limited to the boundaries of a single geographic theatre of military operations, military leaders and analysts have increasingly chosen to highlight the need to deter potential adversary aggression within and across all the five domains of military activity."[1] Emerging technologies have significantly influenced virtually all areas of contemporary warfare. They frequently produce new dynamics that have a substantial impact on the nature of war. Over the past three decades, various powers have increasingly utilised net centricity, battlefield transparency systems, fifth-generation fighter aircraft, long-range air defense systems, attack platforms, drones, and precision-guided munitions. The widespread adoption of these systems has resulted in a substantial increase in the lethality of warfare. Countries that have invested in these technologies now possess a significant advantage over other nations. It is crucial to recognise the importance of new technologies and to acquire them in modern warfare. A fresh set of innovations, commonly known as new technologies in military and technological discourse, possesses the capacity to influence nuclear warfare. Conventional ideas about 'strategic stability' are questioned as these technologies emerge. These advancements are likely to extend beyond the realm of military and encroach upon that of a revolution in military affairs.[2] The revolution in technology is only four decades[3] old, yet its effects are significant where rapid emergence of new developments have been seen. This speedy evolution and progression of technologies gave birth to Cyberspace, Cyber Domain, Cyber Warfare, Artificial Intelligence (AI), Intelligent Agents and Social-Media/Social Media Networks. For routine tasks, the increased dependence on technology has deepened the sophistication and

[1] King Mallory, *New Challenges in Cross-Domain Deterrence* (Santa Monica: RAND Corporation, 2018), 6, accessed June 26, 2024, https://www.rand.org/pubs/perspectives/PE259.html.

[2] Peter Dombrowski and Andrew L. Ross. "The Revolution in Military Affairs, Transformation and the Defence Industry." *Security Challenges* 4, no. 4 (2008): 13–38.

[3] Norman C. Davis, Alvin Toffler, and Heidi Toffler. "An Information-Based Revolution in Military Affairs," *In Athena's Camp: Preparing for Conflict in the Information Age*, ed John Arquilla and David Ronfeldt, RAND Corporation, no. 1 (1997):79–98.

occurrence of cyberspace-related incidents manifold. Besides individual threats, cyber-attacks can also pose a pernicious threat to the strategic stability and national security. Cyberspace is considered as the fifth dimension of warfare, after land, sea, air, and space.[4] To alter the strategic balance in any region, cyberspace has all the potential. Growing trends in AI and autonomous decision-making capabilities have already started altering the shape of future battlefields. AI is now accepted globally to be one of the most wondrous battle balancers.[5] Advancement in military capabilities in the context of AI is expected to have an incremental impact on defense and security, which will directly affect Intelligence, Surveillance and Reconnaissance (ISR), and offensive/defensive balance. This century is also witnessing a huge influx of social media platforms[6] which are easily used to develop or alter the perception of individuals, societies, and nations.

Broadly speaking, strategic stability is dependent upon the interplay of the national capabilities of competing nations. The national power potential is the fundamental edifice upon which the concept of stability rests. Any drastic change in this balance impacts the stability of the region. Narrowing down to the hard power potential (which is intrinsically dependent on national capabilities including economy and geopolitics), it is argued in this paper that strategic stability, the sole property of conventional and nuclear power, is gnawed by emerging technologies. There is a need to understand these effects which are being caused due to this push and pull within the ambit of a classic conflict. Cyberspace nurtures all these capabilities, hosts them, and enables them. All nuclear-armed nations are expected to acknowledge the significance of emerging technologies and pursue appropriate advancements in these areas to preserve the desired equilibrium.

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[4] Harinder Gupta, "Cyber named as the fifth warfare dimension as per the UK armed forces," October 1, 2021, *izzologic.com*, accessed on March 29, 2023, https://izoologic.com/2021/10/01/cyber-named-as-the-fifth-warfare-dimension-as-per-the-uk-armed-forces.

[5] Harinder Gupta, "Cyber named as the…"

[6] Kimberly Edwards-Underwood. "#Evolution or Revolution: Exploring Social Media through Revelations of Familiarity", *Black History Bulletin* 78, no. 1 (2015): 23–28.

The Indian Ocean Region (IOR) is anticipated to be the theatre where emerging technologies will have the most profound impact, despite the Western world enjoying a lead in their implementation. The delicate stability in this area is characterised by a complex network of strategic deterrence and conventional equilibrium, further complicated by unresolved border disputes, hegemonic ambitions, and strategic rivalries involving China, the US, India, and Pakistan, as well as the indirect involvement of Europe and the Middle East. Consequently, technologies possessing the potential to influence these factors cannot be disregarded and must be embraced to ensure stability in the region. This paper aims to examine the classical notion of strategic stability through the lens of the complex interdependence theory, with a particular focus on the IOR.

Complex Interdependence is characterised by three main characteristics: [7] multiple channels exist that connect societies formally and informally, multiple issues exist without any hierarchy or order or agenda, and there is a lack of coordination yet there is a lot of interconnectivity, absence of use of military force towards other governments in the same region. This gives birth to a distinctive political process through which power is used to control and deter. Another paradigm necessary to understand the impact of new technologies is perfect deterrence, [8] whereby credible, competitive, and compatible threats based on capabilities are necessary to ensure deterrence. Therefore, nations with matching capabilities in the latest technologies will experience an evolution in the deterrence equation. Based on these two ideational constructs, the paper will also examine the contemporary trends in the development of new technologies and their implications on strategic stability in the IOR.

IOR and Strategic Competition

The IOR comprises the ocean and bordering nations. Strategically, the Indian Ocean & Pacific Ocean are seen as one large water body joined by

[7] Robert O Keohane and Joseph S Nye, *Power and Interdependence* (New York: Longman, 2012), 1-365.
[8] Frank Zagre and Marck Kilgour, *Perfect Deterrence* (Cambridge: Cambridge University Press, 2000), 1-414.

its main trading channel, the Straits of Malacca. Strategically located at the crossroads of global trade: 80% of the world's maritime oil[9] trade flows through this chokepoint. The Indian Ocean is a very old water highway that is of great economic value and of immense security importance not only for those who live on its shores but also who pass through it.[10] The Ocean was and is still vital for global powers of the past and present as endorsed by Robert D. Kaplan in his book *The Monsoon.*[11] Currently, the Indian Ocean is witnessing the shifting of economic boom in its zone and is expanding to embrace the new opportunities. It is exceedingly rich in natural resources: 40% of the world's off shore oil is produced in the Indian Ocean basin,[12] while fishing alone is 15%[13] of the total production of the world. The region is vividly complex in terms of economic potentials, geo-strategic importance and strategic development and is becoming the center of global commerce and conflicts alike.[14] The IOR, once a neglected ocean,[15] is today the hub of political, strategic, and economic activities. Major Powers are traversing the zone in quest of

[9] Craig Jeffrey, "Why the Indian Ocean Region might soon play a Lead role in World Affairs," *The Conversation,* January 15, 2019, https://theconversation.com/why-the-indian-ocean-region-might-soon-play-a-lead-role-in-world-affairs-109663.

[10] Eleanor Albert, "Competition in the Indian Ocean," *The Council on Foreign Relations*, May 19, 2016, https://www.cfr.org/backgrounder/competition-indian-ocean.

[11] Robert D. Kaplan, "Monsoon, *The Indian Ocean and the Future of American Power* (New York: Random House, 2010), 1:366.

[12] Pabasara Kannangara, Adam Collins and Barana Waidyatilak, "The Importance of the Indian Ocean: Trade, Security and Norms," *Lakshaman Kadirgabar Institute*, October 5, 2018, https://lki.lk/publication/the-importance-of-the-indian-ocean-trade-security-and-norms.

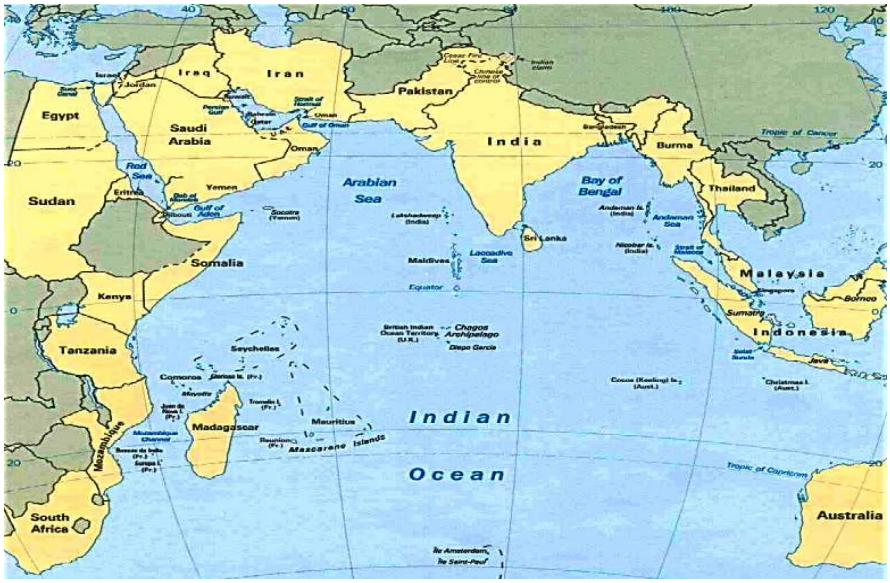
[13] Pabasara Kannangara, Adam Collins and Barana Waidyatilak, "The Importance …".

[14] "Major Powers' Interests in Indian Ocean: Challenges and Options for Pakistan," Islamabad Policy Research Institute, accessed June 18, 2020, https://ipripak.org/major-powers-interests-in-indian-ocean-challenges-and-options-for-pakistan.

[15] Christian Bouchard and William Crumplin, "Neglected no longer: the Indian Ocean at the forefront of World Geopolitics and Global Geostrategy," *Journal of the Indian Ocean Region* 6, no.1 (2010): 26-51.

influence by their military capabilities.[16] A complex geopolitical framework is emerging with interests and objectives interlinked and competing. Middle East's simmering situation, Afghanistan imbroglio, US-China strategic competition, Indo-China hedging, and aspirations have made the IOR a crucially important zone. India considers its aspirations as a 'manifest destiny' to take control of the Ocean and littoral states[17] and to fully realise the ambitions solely. It is aligned with the United States, in achieving this objective, to a larger extent.

Map 1



Source: *The Indian Ocean, accessed on March 25, 2023, https://www.bluebird-electfic.net/oceanography/indian_ocean.htm*

[16] Beenish Ansari, "Indian Ocean Region: A Great Game for Strategic and Nuclear Supremacy," *Strafasia,* November 26, 2019, https://strafasia.com/indian-ocean-region-a-great-game-for-strategic-and-nuclear-supremacy.

[17] Don Berlin, "The Rise of India and the Indian Ocean," *Journal of the Indian Ocean Region* 7, no.1 (2011): 1-31.

China wants to integrate the IOR in the overall context of the Belt and Road Initiative (BRI) and Maritime Silk Road Corridor, which is not well received amidst the US-China-India power triangle.[18] India has a security-centric approach. On the other hand, China has an economic-centric approach. Both are contesting and competing for strategic superiority in the IOR. The ever-increasing access available to China to various ports, airfields, and energy resources, its expanding and assertive navy, and huge infrastructure development-related investments in the littoral nations of the IOR are raising Indian concerns exponentially.[19] China's growing naval capability in terms of submarine operations and anti-submarine arsenal, anti-ship missiles, advanced surface combatants, and deployment at longer ranges are significantly a matter of concern for India from a security perspective. [20] China is developing new markets from Eurasia to Europe and Africa linking through Asia and ultimately through the BRI, turning the Eurasian landmass into an economic and strategic region.[21] China is securing its vital interests in the IOR by a complex web of 'soft power' with its cardinals of diplomacy, trade, assistance in humanitarian aspects, arms trade, construction of ports, and strategic partnerships with selected partners. China has gradually established maritime bases by virtue of BRI, thus protecting its access to SLOCs and also safeguarding its interest in the Pacific Ocean.[22] China's economic growth is tremendous, where in 2024 the GDP of China was around $18.6 trillion and it was able to compete with the US with a per capita GDP of around

[18] Jan Hornat, "The Power Triangle in the Indian Ocean: China, India and the United States," *Cambridge Review of International Affairs* 29, no. 2 (2016): 425-443.
[19] Teshu Singh, "The Malabar Exercises: India, Japan and the US," *Institute of Peace and Conflict Studies*, January 31, 2014, http://www.ipcs.org/comm_select.php?articleNo=4282.
[20] "Asia-Pacific Regional Security Assessment", *International Institute of Strategic Studies*, 2016.
[21] Gideon Rachman, "An Assertive China Challenges the West*," Financial Times,* October 23, 2017.
[22] Scott N. Romaniuk and Tobias Burgers, "China's Next Phase of Militarization in the South China Sea," *The Diplomat*, March 20, 2019, https://thediplomat.com/2019/03/chinas-next-phase-of-militarization-in-the-south-china-sea.

$13,156 and defense spending of $219.5bn being 2nd largest in the world.[23]

India is the largest country in IOR. It also has the capabilities to control the SLOCs, and can potentially dominate the region geographically. India has intensified diplomatic, economic, and strategic interactions, and relations with like-minded nations equally concerned about the Chinese trajectory in the region related to economic and military strength.[24] Although India has increased its engagement, it is grappling with several internal issues hindering its further expansion. It is yet to have matching resources to compete with China in trade and commercial investments. Sino-Indian competition is grounded in their economic trajectories and related strategic dependence on SLOCs for energy and trade, which passes through the IOR. The character of the BRI is a source of concern for India. This complexity is morphing into an increasing Sino-India competitiveness. This historic rivalry initially limited to the mountainous border region in the Himalayas resulted in a conflict in 1962[25] and is now extended into ocean(s). Indian strategic thinkers feel that China has encircled India, while China itself is feeling the effects of its limited ability to secure the SLOCs, especially once the Sino-US strategic partnership is in place. Among the 36 littoral states of the IOR, India emerges as the most powerful due to its economy and military potential. Hence, it also enjoys cooperation from other powers like the US, Japan, and Australia, as it serves their strategic plans as well. This gives natural hegemony to India in sharing regional security in the Indian Ocean. It is this collusion that has disturbed the strategic balance in the IOR.[26] Worth $2.1 trillion, India is the world's third-largest economy after the US and

[23] IISS, *The Military Balance 2024*, 253.
[24] K.V. Kesavan, "India's 'Act East' Policy and Regional Cooperation," *Observer Research Foundation*, February 14, 2020, https://www.orfonline.org/expert-speak/indias-act-east-policy-and-regional-cooperation-61375.
[25] Amit R. Das Gupta and Lorenz M. Lüthi, *The Sino-Indian War of 1962: New perspectives* (New York: Routledge, 2017), 1-268.
[26] Amin Sohail, "Major Powers' Interests in the Indian Ocean: Challenges and Options for Pakistan," *Islamabad Policy Research Institute*, 2015: 2.

China.[27] As per Military Balance 2024, India has a GDP of $4.11 trillion,[28] while it became the fourth largest defense spender in 2023 as its defense spending grew by 6.8% reaching $73.6bn -- motivated basically due to growing strategic competition in the region.[29]

The IOR serves as a critical geostrategic link between energy-rich Arab countries and economically dynamic Asian states.[30] Some of the IOR's coastal states are aligning with China through accommodative strategies, while others are resisting China's ambitious approach and are building their defense capabilities and forming strategic alliances and partnerships. The IOR states may be using the competition between India and China to their advantage by seeking foreign aid, military assistance, trade, and investment benefits. Furthermore, the US itself is concerned about the growing prominence of the Indian and Chinese forces, which could potentially challenge the strategic superiority of the US.[31]

Pakistan is also an IOR state, which is strategically positioned at the edge of the Arabian Sea, jutting out close to the Strait of Hormuz. Pakistan's coastline is 990 km[32] of which 720 km (75%) is the Makran coastal belt in the province of Balochistan. The remaining 25% of the coastline i.e., 270 km is in Sindh province. It forms part of the Indus River delta. Pakistan is a large littoral state, with 5th largest population of over 220 million

[27] India at a Glance, *Food and Agriculture Organization of the United Nations,* accessed October 24, 2023, https://www.fao.org/india/fao-in-india/india-at-a-glance/en/
[28] IISS, *The Military Balance 2024*, 247.
[29] Siemon T. Wezeman, "Global military expenditure sees largest annual increase in a decade—says SIPRI—reaching $1917 billion in 2019," *Stockholm International Peace Research Institute (SIPRI),* April 27, 2020, https://www.sipri.org/media/press-release/2020/global-military-expenditure-sees-largest-annual-increase-decade-says-sipri-reaching-1917-billion.
[30] Bruce Vaughan, "China-India Great Power Competition in the Indian Ocean Region: Issues for Congress," *Every CRS Report,* April 20, 2018, https://www.everycrsreport.com/reports/R45194.html.
[31] Evan S. Medeiros, "The Changing Fundamentals of US-China Relations," *The Washington Quarterly* 42, no.3 (2019): 93-119.
[32] Ministry of Climate Change (Pakistan), *A Handbook on Pakistan's Coastal and Marine Resources* (Islamabad: MFF, 2016), 6-8.

people[33] in the IOR, and is a nuclear state. As Military Balance 2024, Pakistan has a defense budget of $13.3bn for 2023-2024 and is maintaining a large standing Army, Air Force, and Navy along with strategic forces of 651,800 all-inclusive.[34] Owing to its location, ensuring maritime security is a vital element of Pakistan's policy. Pakistan cannot choose to remain oblivious to what is happening in its surroundings and what new developments are evolving in the IOR, as these all have a strategic connection with progress, development, and security. Pakistan believes that the *Indian Ocean is not India's Ocean*, however, India desires and exhibits the same to dominate it being a larger nation which is having a bigger economy, diplomatic clout, and military capabilities as compared to other states. Pakistan is, thus, eager to see the success of the BRI. Therefore, under the banner of an 'all-weather friendship' between China and Pakistan, there are promising prospects of investments, development, and a strategic balance between Indo-Pak tense relationships.[35] The strategic competition in IOR between India and Pakistan is paradoxical, where India aims to dominate seeking US, Japan, and Australia to counter China, while Pakistan does not seek to do so. India and Pakistan have fought wars in 1947, 1965, 1971, and 1999, besides several clashes in Kashmir's contested border region due to strained relations and strategic differences

Strategic Stability and Deterrence Paradigm in IOR

The use of force to deter potential adversaries from achieving political objectives has been a recurring phenomenon throughout human history. However, the development of nuclear weapons fundamentally altered this concept due to their ability to destroy entire civilisations.[36] Deterrence,

[33] "Pakistan Population," Worldometer, accessed June 18, 2020, https://www.worldometers.info/world-population/pakistan-population.
[34] International Institute for Strategic Studies (IISS), *The Military Balance 2024* (London: Routledge, 2023): 300.
[35] Huma Sattar, "China and Pakistan's All-Weather Friendship," *The Diplomat*, March 12, 2015, https://thediplomat.com/2015/03/china-and-pakistans-all-weather-friendship.
[36], A. W. Betts "Nuclear Weapons", *The Military Engineer* 41, no. 280 (1949): 104–7. http://www.jstor.org/stable/44564620.

which serves as the cornerstone of national security strategy, is a multifaceted concept that can be simplified as the anticipated cost of retaliation for an undesirable action, which outweighs any potential benefits. Essentially, the stability of deterrence is directly proportional to the cost of retaliation, with higher costs resulting in more robust deterrence. If the perceived cost of retaliation becomes acceptable, the deterrence equation becomes unstable, potentially leading to failure. In the IOR, deterrence dynamics are particularly complex, and the 'Stability-Instability Paradox' originally described by Glenn Snyder remains valid.[37] The region's threat landscape is intricate, characterised by geopolitical competition between global and regional powers, conflicts with neighbouring countries, and exploitable internal vulnerabilities. Although strategic stability existed during the period of post-nuclearisation, and military confrontations were averted, it failed to prevent the emergence of crises at the lower end of the conflict spectrum. The conflict domain transitioned into a gray hybrid construct. Recently, with the escalating strategic competition between China and the US, India's pursuit of BMD,[38] the Indo-US nuclear deal,[39] access to cutting-edge technologies, advancements in space and missile technology, and the emergence of the latest technologies and the conceptual paradigm of Cross Domain Deterrence[40] have added a new layer of complexity to the deterrence paradigm. The hybrid threat environment interlaced with emerging technologies has made strategic stability tenuous.

[37] Glenn Snyder, "Deterrence: A Theoretical Introduction," in *Theories of Peace and Security: A Reader in Contemporary Strategic Thought,* ed. John Garnett, (Mc Millan: St Martin Press, 1970): 38.
[38] Shervin Taheran, "India Closes on Russian Missile System Deal," *Arms Control Association,* November, 2011, https://www.armscontrol.org/act/2018-11/news/india-closes-russian-missile-system-deal.
[39] Jayshree Bajoria and Esther Pan, "The U.S.-India Nuclear Deal," *Council on Foreign Relations*, November 5, 2010, https://www.cfr.org/backgrounder/us-india-nuclear-deal.
[40] John R. Lindsay and Eric Gartzke, *Cross Domain Deterrence: Strategy in an Era of Complexity* (New York: Oxford University Press, 2019), 3.

Strategic stability has many definitions. It is '*a state of affairs in which countries are confident that their adversaries would not be able to undermine their nuclear deterrent capability'* using nuclear, conventional, cyber, or other unconventional means.[41] In the theory of Regional Security Complex by Barry Buzan, dynamics of conflicts in a region can lead to either *hegemony* or *balance of power*.[42] The nature of the regional environment is a critical factor in the overall context. The IOR is transitioning from being a security regime, where some guarantees of security exist, to a state of conflict formation, where none does. The regional environment in IOR is thus characterised by hegemonic-objective conflict. There is a contradictory concept of détente[43] at play. The fact that détente helped improve deterrence stability was amply demonstrated during the protracted conflict between the US and the former USSR. In IOR, the environment is characterised by mutual hostility; asymmetric conventional force differential; and non-aggressive/non-transparent nuclear doctrine. These are the missing components of the equation (détente). Provocative expansions, hegemonistic designs, the latest disruptive technologies, nuclear arsenal, and many force multipliers are opposed by retaliatory notions of deterrence, thereby putting strategic stability and *détente* on a razor edge. It is interesting to note that analogies drawn in the Cold War, nuclear scenarios have limited utility in this region due to geographical contiguity, active border conflicts (Kashmir, Doklam, China Sea), and strategic competitions.[44]

[41] Podvig, P., 'The myth of strategic stability,' *Bulletin of the Atomic Scientists*, 31 Oct. 2012.
[42] Barry Buzan, Ole Wæver and Jaap de Wilde, *Security: A New Framework for Analysis* (USA: Lynne Rienner Publishers, 1997)
[43] Brian White, "The Concept of Detente", *Review of International Studies* 7, no. 3 (1981): 165–71. http://www.jstor.org/stable/20096917.
[44] R Nicholas Burns, "America's Strategic Opportunity with India," *Foreign Affairs*, November 1, 2007, accessed on March 28, 2024, https://www.foreignaffairs.com/articles/asia/2007-11-01/americas-strategic-opportunity-india

Deterrence is a strategic concept that has been used since the 8th millennium B.C, [45] but it was not until the 20th century that it gained formal recognition. During the Cold War, deterrence underwent significant changes and was divided into four distinct phases.[46] The first phase emerged after the use of atomic bombs in the 1940s, and the second phase focused on the application of game theory to determine desired effects and actions. The third phase emphasised the psychological aspects of deterrence, while the fourth phase introduced asymmetric deterrence, which involved non-state entities and the use of economic sanctions, diplomatic, and political tools to deter actions in various domains. This approach disincentivise players from using any tools at their disposal, whether vertically or horizontally, in any domain. The evolution of deterrence has added complexity to the concept, and it is now referred to as Cross Domain Deterrence.[47] Traditionally, deterrence has been practiced in the domains of land, air, and sea, but it now involves the use of non-military domains, such as economic sanctions and diplomatic and political tools, to deter actions in the military domains of land, sea, air, space, and cyber.[48] It is under this new paradigm, the latest technologies are becoming enablers and force multipliers. In the subsequent part, a few latest technologies are being discussed that have an impact on nuclear deterrence and resultantly, these are impacting the strategic stability of the IOR.

New Technologies and Nuclear Deterrence

The 21st century has seen a profound impact on military and strategic affairs due to rapid technological advancements. It is widely acknowledged that technological innovation has consistently played a crucial role in maintaining geo-political stability and shaping international

[45] Tim Sweijs and Samo Zilincik, *Cross Domain Deterrence and Hybrid Conflict* (Netherlands: The Hague Centre, 2019),11.
[46] Tim Sweijs and Samo Zilincik, "*Cross Domain Deterrence…"*
[47] Lindsay and Gartzke, *Cross Domain Deterrence*…
[48] R. J. Vince, "Cross-Domain Deterrence Seminar Summary Notes," May 1, 2015, https://www.slideshare.net/LivermoreLab/summary-notes-47797997.

relations. The introduction of rifles, tanks,[49] missiles, submarines,[50] aircraft carriers, and nuclear weapons,[51] among other technological advancements, has demonstrated how drastic changes in international relations can occur during and after conflict.[52] Contemporary innovations, such as cyber technology, Artificial Intelligence, hypersonic weapons, precision guidance, space technologies, and information-related techniques (including big data and information operations) are significantly impacting the behaviour of nations in peacetime, conflict, and post-conflict scenarios.

During peace, these technologies will have a significant impact on arms race, proliferation, and even arms control agreements. In the context of conflict, these technologies influence the stabilisation of crises through deterrence, coercion, and even the initiation and termination of the war. Post-conflict scenarios may also be impacted by these technologies in terms of bargaining and post-conflict settlements related to the concept(s) of victory. The diffusion[53] of these new technologies has the potential to be a game-changer and may alter the existing strategic equation. They can serve as an equaliser for some nations, act as leverage for others, and even erode military advantages,[54] presenting a challenge to the future security

[49] Kyle Mizokami, "100 Years Ago Today, Tanks Changed Warfare Forever," *Popular Mechanics,* September 15, 2016, https://www.popularmechanics.com/military/weapons/a22880/100-years-ago-today-tanks-changed-warfare-forever.

[50] Karl Lautenschlager, "Submarines in Naval Warfare:1901-2001," *International Security* 11, no. 3 (1986-1987): 94-140.

[51] Andrew L. Ross, "The Role of Nuclear Weapons in International Politics: A Strategic Perspective," *Foreign Policy Research Institute* 14, no. 5 (2009): 1-5.

[52] Todd S. Sechser, Neil Narang & Caitlin Talmadge, "Emerging Technologies and Strategic Stability in Peacetime, Crisis, and War," *Journal of Strategic Studies* 42, no. 6 (2019): 727-735.

[53] Michael Green, Kathleen Hicks and Mark Cancian, *Asia-Pacific Rebalance 2025: Capabilities, Presence, and Partnerships* (Washington DC: Centre for Strategic and International Studies, 2016), 208.

[54] US Department of Defense, "SecDef Hagel Innovation Memo 2014," accessed on June 21, 2020, https://www.scribd.com/doc/246766701/SecDef-Hagel-Innovation-Memo-2014-11-15-OSD013411-14.

environment. [55] The traditional concept of nuclear deterrence is being challenged, as the strategic effects of other emerging technologies and non-military domains are becoming more prominent. Paradoxically, nuclear deterrence is being enhanced to mitigate the effects of these other technologies by nations that are not in a position to invest.

Hypersonic Weapons: With a speed of Mach 5,[56] there are two categories of hypersonic weapons, Hypersonic Glide Vehicles (HGV) and Hypersonic Cruise Missiles.[57] These weapons can change course during flight and do not follow a fixed path or ballistic trajectory. They can challenge detection because of high speed and maneuverability even at low altitudes, can reach deeper and denied target areas, and can use kinetic energy to destroy targets.[58] HGV differs from the traditional ballistic glide in the upper atmosphere using aerodynamic force.[59] This weapon can carry conventional or a nuclear payload, however, this is yet ambiguous which increases the risk of a miscalculation or misperception. The US, China, Russia, and even India[60] are engaged in developing these weapons. The US and Russia have been pursuing this since the 1980s, and it is being claimed that these weapons would pose a threat which virtually has no defense against it as of now.[61] Effect of such weapons of deterrence is pronounced once it is seen in the context of geo-contiguity in

[55] US Department of Defense, "Summary of the 2018 National Defense Strategy of the United States of America," accessed June 21, 2023, https://dod.defense.gov/Portals/1/Documents/pubs/2018-National-Defense-Strategy-Summary.pdf.

[56] "Mach Number," Glen Research Centre, NASA accessed June 22, 2023, https://www.grc.nasa.gov/www/k-12/airplane/mach.html.

[57] Kelley M. Sayler, "Hypersonic Weapons: Background and Issues for Congress," *US Congressional Research Service*, July 11, 2019, https://assets.documentcloud.org/documents/6189872/Hypersonic-Weapons-Background-and-Issues-for.pdf.

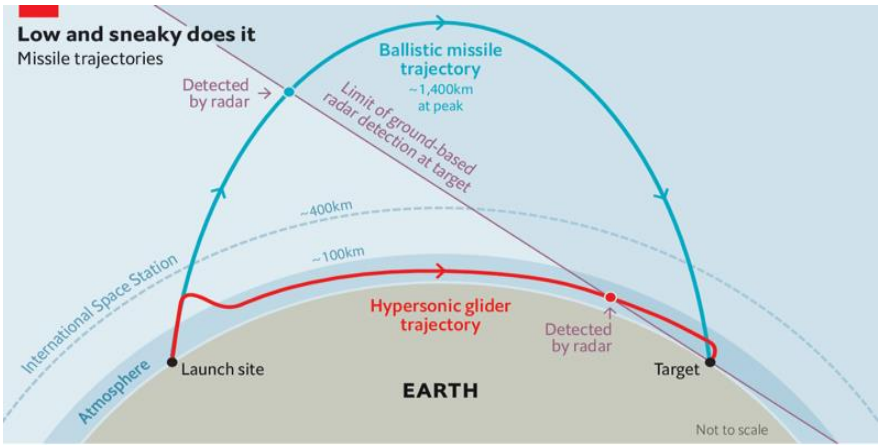
[58] Kelley M. Sayler, "Hypersonic Weapons: Background…"

[59] Paul Fraioli, "Hypersonic Weapons and Strategic Stability," *Strategic Comments* 26, no. 4 (2020):1-3.

[60] Huma Rehman, What India's MIRV test adds to the 'strategic trilemma' in South Asia", *Bulletin of the Atomic Sciences*, May 3, 2024, https://thebulletin.org/2024/05/what-indias-mirv-test-adds-to-the-strategic-trilemma-in-south-asia.

[61] Ivan Oelrich, "Cool your jets: Some Perspective on the Hyping of Hypersonic Weapons," *Bulletin of the Atomic Scientists* 76, no. 1 (2020): 37-45.

the IOR. Similarly, a limited quantity of such weapons may not be able to alter the strategic stability. [62] However, their utility as mass destruction weapons can alter the strategic balance. Given the cost and other contributory factors inhibiting the massive investment, fewer hypersonic weapons would be able to accentuate the warfare in the gray zone. These weapons would be added to the latest combined arms dilemma[63] where new technologies and traditional forces are intertwined.



Source: *"Gliding missiles that fly faster than Mach 5 are coming," The Economist, April 6, 2019.*

Artificial Intelligence: The question of whether machines can think was first posed in 1950,[64] and has now been answered in the affirmative with the emergence of AI, and machines capable of human-like thought and reasoning.[65] AI is being recognised as the third offset strategy[66] to address

[62] 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.
[63] Alan Cummings, " Hypersonic Weapons: Tactical …"
[64] A. M. Turing, "Computing Machinery and Intelligence," *Mind* 49 (1950): 433-460.
[65] Stuart J. Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach* (Harlow: Pearson Education, 2016), 1-33.
[66] Kenneth Payne, "Artificial Intelligence: A Revolution in Strategic Affairs," *Survival* 60, no. 5 (2018): 7-32.

strategic disadvantages. AI is visible in military applications and is also being used in healthcare, information technology, and automobile manufacturing. AI is not yet fully mature, and it presents issues related to ethics, expertise, and arms control. While AI is effective at tactical and operational levels, [67] it is expected to have significant effects at the strategic level, including changes to the power balance, risk aversion, and mitigation, favouring offensive action, shaping the entire spectrum of violence, and controlling entire military operations.[68] The concept of Net-Centric Warfare using all connected devices (radars, sensors, weapons, drones, sea vessels, aircraft, satellites, and human sources) as information and action platforms is dependent[69] on AI. It is a disruptive technology and once integrated with lethal automated weapons like robots and other weapon systems – it projects a complex picture. AI poses certain risks.[70] For instance, E*thical risks* from humanitarian point of view threatens job security, and social structure, attributed to empathy and consideration. Similarly, the *Operation risks* related to fragility, reliability, security, attributability and control of weapons and machines. *Strategic risks* related to escalation control, conflict initiation, use by non-state actors (NSA) and cyber based intrusions. AI cannot be fully trusted or relied upon, as its capabilities are influenced by states' strategic force structures. AI-generated disinformation can produce significant strategic effects, and the security of AI systems remains a vulnerability due to cyber threats. In the realm of deterrence, AI can serve as a force multiplier or a leveraging tool. Nuclear weapons and a variety of weapon systems will continue to function as deterrents, while AI will serve as the software to enhance or undermine them.

[67] Kareem Ayoub and Kenneth Payne, "Strategy in the Age of Artificial Intelligence," *Journal of Strategic Studies* 39, no. 5-6 (2016): 793–819.
[68] Payne, "Artificial Intelligence…" 11-28.
[69] Debasis Dash, *Autonomy and Artificial Intelligence: The Future Ingredient of Area Denial, Strategy in Land Warfare* (Delhi: Centre for Land Warfare Studies, 2018), 1-31.
[70] Inam ul Haque, "The Future of Warfare and Artificial Intelligence," *The Express Tribune*, June 4, 2020, https://tribune.com.pk/story/2234889/6-future-warfare-artificial-intelligence.

Space Technologies: Space is a global common. The Outer Space Treaty 1967 was signed by more than 100 nations. It prohibits militarisation of space, no weapons of mass destruction can be placed in outer space and it does not allow any military activities on celestial bodies.[71] The quest for space supremacy re-emerged after the Cold War once various nations started developing anti-satellite technologies.[72] It affected all other enmeshed capabilities and potentials. As of now, 2,666 satellites are orbiting around the earth, owned and operated by more than 50 different countries and organisations.[73] In modern warfare, space is emerging as an important domain and can affect other related capabilities as well. Space-based capabilities in terms of information and intelligence, surveillance, communications, navigation, command, and control are very important in a host of other capabilities having direct linkages to deterrence. Presently ground-based anti-satellite technologies, direct energy weapons, jamming capabilities and cyber capabilities are having pronounced effects in space and satellites.[74] The nations are involved in developing disruptive technologies and also taking measures to safeguard their space assets, which have strong security implications and can alter the strategic stability. The advantages that are accrued due to integrated space-based support to conventional and strategic assets are so pronounced and tempting that today it has become an important domain for operations.[75] Space today is becoming significantly decisive and fundamental for the conduct of advanced warfare. Equations of deterrence based on nuclear alone will be altered because of the space factor and this would also have

[71] Daryl Kimball, "The Outer Space Treaty at a Glance," *Arms Control Association*, accessed June 23, 2020, https://www.armscontrol.org/factsheets/outerspace.
[72] Jim Garamone, "Work: Space Domain Presents Challenges, Threats," *US Department of Defence News*, April 16, 2015, https://www.defense.gov/Explore/News/Article/Article/604475/work-space-domain-presents-challenges-threats.
[73] "Satellite Database," Union of Concerned Scientists (UCS), accessed June 23, 2020, https://www.ucsusa.org/nuclear-weapons/space-weapons/satellite-database.
[74] Ibid.
[75] Benjamin W. Bahney, Jonathan Pearl, and Michael Markey, "Anti-satellite Weapons and the Growing Instability of Deterrence," in *Cross-Domain Deterrence: Strategy in an Era of Complexity*, eds. Jon R. Lindsay and Erik Gartzke (New York: Oxford University Press, 2019), 121-143.

a significant effect in other domains. Most of the space technologies are for dual use, therefore, nations rely on them to enhance their military potential.[76] As a consequence, deterrence is affected.

Cyberspace Technologies: Cyber in its essence conveys something digital and automated having a dependency on computers and the peripherals[77] (wired or wireless included). Part of cyber is in outer space and it is interesting to note that while space is a physical domain, cyberspace is a congregation of human-made instruments and systems.[78] Cyberspace emerged as a war-fighting domain[79] in US policy circles in 2006, as it is the only medium through which all other domains, institutions, peripherals, or networks are integrated. Cyberspace is extremely vulnerable and at present, its offensive and defensive potential is being contested. Related technologies and methodologies are being devised and experimented upon. All technologies aimed at disrupting or safeguarding from disruption in this domain are termed as cyberspace technologies. Cyberspace weapons and technologies are difficult to distinguish and attribute. Its actual intent is disguised and, the effect is directly proportional to the characteristics of the target and the prior relationship is important.[80] Cyberspace warfare and technologies are potentially offensive. It is interesting to note that the three leading nuclear powers, the US, China, and Russia are also leading in cyber warfare and related technologies.[81] Currently, cyber technologies are being used for geo-political motives and integrated into warfare capabilities. Models of deterrence are not immune to the effects of cyber technologies and are also not dependent on them. Correlating both, Stephen J. Cimbala aptly highlighted that the interaction of nuclear deterrence and the amount of

[76] IISS, *The Military Balance 2023*.
[77] Jacquelyn G Schneider, "Deterrence in and Through Cyberspace," in *Cross Domains Deterrence: Strategy in Era of Complexity*, eds. John R Lindsay and Erik Garztke (New York: Oxford University Press, 2019), 95-120.
[78] Lindsay and Garztke, *Cross Domains Deterrence*, 7-9.
[79] Ibid.
[80] Herbert Lin and Amy Zegart, eds, *Bytes, Bombs, and Spies: The Strategic Dimensions of Offensive Cyber Operations* (Washington DC: Brookings Institution Press, 2019), 7.
[81] David C. Gompert and Martin Libicki, "Cyber War and Nuclear Peace," *Survival* 61, no. 4 (2019):45-62.

confusion by a cyber-attack has the potential to exponentially complicate any nuclear crisis.[82] China, India, and even the US are investing in the capabilities of cyberspace in the IOR.

Information Warfare Technologies: Information is the new gold of the 21st century. Its use and potential to be misused has become a strategic concern. While operating in a time and space-compressed conflict zone, information can be a vital resource or a lethal weapon. It is the simultaneity of actors in various military (land, air, sea, nuclear, space & cyberspace) and non-military (political, economic, social & diplomatic) domains that poses a real challenge.[83]

Information is vital to any nation and it significantly runs across the complete spectrum of the national power of a nation. Information technologies as of today are advantageous and valuable, yet they are also extremely susceptible to interference, deception, infiltration, intrusions, pilferage, theft, and destruction.[84] The offensive information warfare is manifested in various shapes and dynamics, using soft power tools (taking the example of the Indian film industry to shape public opinion),[85] dexterous use of social media (used in Arab Spring),[86] electronic media (US-Iraq War),[87] propaganda (fake news),[88] narratives (Brexit campaign,[89]

[82] Stephen J. Cimbala, "Nuclear Deterrence and Cyber Warfare: Coexistence or Competition," *Defense and Security Analysis* 33, no. 3 (2017): 193-208.
[83] Nick Brunetti, "Information Warfare Past, Present, and Future," *Real Clear Defense*, November 14, 2018.
[84]For further study see, Gary F. Wheatley and Richard E. Hayes, *Information Warfare and Deterrence* (NDU Press, 1996).
[85] Daya Kishan Thussu, "The Soft Power of Popular Cinema – The case of India," *Journal of Political Power* 9, no. 3 (2016): 415-429.
[86] Halim Rane & Sumra Salem, "Social media, social movements and the diffusion of ideas in the Arab uprisings," *Journal of International Communication* 18, no. 1 (2012): 97-111.
[87] Nobuo Kamioka, "Support Our Troops: The U.S. Media and the Narrative of the Persian Gulf War," *The Japanese Journal of American Studies*, no. 12 (2001): 65-81.
[88] Robinson Meyer, "The Grim Conclusions of the Largest-Ever Study of Fake News," *The Atlantic*, March 8, 2018.
[89] Alexander Spencer & Kai Oppermann, "Narrative Genres of Brexit: The Leave Campaign and the Success of Romance," *Journal of European Public Policy* 27, no. 5 (2020): 666-684.

the US presidential election campaign). Social media is gaining ultimate currency where it can reshape the conflict in the 21st century. David Patrikarakos in his book *War in 140 Characters* has amply highlighted the character of future warfare with blurred boundaries between battlefield and political discourse. New technologies have reshaped, transformed, and empowered people to an unimaginable level where they can disrupt and influence the conflict in time, space, and methods as well.[90] Smartphones, the Internet, social media, TV, radio, streaming platforms, books, magazines, and pamphlets are a host of items, and related technologies that are used in the information war. Passive operations like hacking, data gathering, and eavesdropping allow one to identify and study the target while spreading false news, inducing narratives, intrusion in networks, discrediting and campaigning are some of the offensive operations undertaken in information warfare. Information technologies have multiple effects on the overall deterrence concept; they can complement a developed state, can diffuse by a matching capable state, and even can erode deterrence by a weak party or even NSA.[91] The application in IOR is apt and manifested multiple times.

Impact of New Technologies on Strategic Stability in the IOR: Strategic competition and strategic stability are understandably fluid. Changes in drivers and vectors would alter the balance. The discussion in the paper takes into account this dynamism and the peculiar security architecture of the IOR further amplifies the thesis that emerging technologies are impacting strategic stability and gradually new domains are trying to take the place of nuclear and strategic capabilities. In the 21st century with the rise of military capabilities (space, cyberspace, land, air, and sea), non-military capabilities (political, diplomatic, economic, media,

[90] David Patrikarakos, *War in 140 Characters: How Social Media is Reshaping the Conflict in the 21st Century* (New York: Basic Books, 2017): 1-320.

[91] Paulo Fernando Viegas Nunes, "The Impact of New Technologies in the Military Arena: Information Warfare," *The Information Warfare Site*, accessed December 24, 2023, http://www.iwar.org.uk/iwar/resources/technology/nunes.htm.

and intelligence) and disruptive technologies (AI, Hypersonic weapons, cyber), strategic stability is under great stress.[92]

- The consequences for the durability of nuclear weapons will be considerable as a result of the development of modern technologies that enable adversaries to identify, counteract, or hinder the second strike. This could result in an elevated probability of an early deployment or encourage the first use of these weapons.[93]
- The Stability-Instability paradox encompasses the region, particularly concerning India-Pakistan.[94] Although both nuclear-armed archrivals have been deterred from engaging in an all-out war, the possibility of low-intensity armed conflict or limited war in a sub-conventional or hybrid threat scenario cannot be entirely ruled out. [95] Any new development in the region, including the development of small conventional arsenals, unmanned aerial vehicles (UAVs), or advancements in cyber or information warfare domains, could impact regional stability. Additionally, the integration of AI, autonomy, and machine learning into military systems aggravates the existing instability in the region.
- The complex and dangerous dynamics of the IOR entail numerous incidents with the potential to escalate among nuclear-armed states, as evidenced by events such as Pulwama[96] and Doklam.[97] These

[92] Jasmine Moheb, "Interview with Professor Erik Gartzke—Cross-Domain Deterrence: A Battle of Wills in the 21st Century," *Prospect,* June 13, 2019.
[93] Rickli, J.M., 'The destabilizing prospects of artificial intelligence for nuclear strategy, deterrence and stability,' ed. V. Boulanin, *The Impact of Artificial Intelligence on Strategic Stability and Nuclear Risk* I, Euro-Atlantic Perspectives (SIPRI: Stockholm, 2019).
[94] Sumit Ganguly, "Indo-Pakistani Nuclear Issues and the Stability/Instability Paradox," *Studies in Conflict & Terrorism* 18, no. 4 (1995): 325–34. doi:10.1080/10576109508435989.
[95]Arvind Kumar, 'Theories of deterrence and nuclear deterrence in the subcontinent', ed. E. Sridharan, *The India-Pakistan Nuclear Relationship: Theories of Deterrence and International Relations* (New Delhi: Routledge, 2018).
[96] Moeed W. Yusuf, "The Pulwama Crisis: Flirting with War in a Nuclear Environment," Arms Control Association, accessed July 1, 2020, https://www.armscontrol.org/act/2019-05/features/pulwama-crisis-flirting-war-nuclear-environment.

events illustrate the persistent strain on strategic stability, which could escalate non-linearly if AI and autonomous systems become involved.

- The risk of strategic instability is exacerbated by the possibility of false alarms from these systems and inaccurate data from early warning, ISR, and BMD sensors. Furthermore, the development of autonomous platforms with dual capabilities may cause other nations to worry about an unexpected nuclear attack, if either of the two nations deploy such a platform.
- The use of advanced technology can potentially reduce the chances of nuclear conflict while also presenting the risk of instability. For instance, incorporating AI in satellite imagery and remote sensing can aid in accurately interpreting the activities of adversaries. The implementation of pre-determined monitoring procedures may help prevent unintentional escalations. [98]
- The enhanced detection capabilities may lead to an arms race, which could result in an escalation of the situation or a deceptive portrayal of an adversary's capabilities, ultimately leading to pre-emptive strikes in the region. Data, which is a critical component in machine learning algorithms, is also vulnerable to human-initiated spoofing attacks or data poisoning.
- To achieve perfect deterrence,[99] countries in the IOR will have to allocate substantial resources to acquire and develop advanced technologies. The cost of these investments may compel these nations to pursue international collaborations, potentially resulting in a transition toward a politico-military-economic paradigm in the region as a means of attaining strategic stability.

[97] Sumit Ganguly, "India and China: On a Collision Course?" *Pacific Affairs* 91, no. 2 (2018): 231–44.

[98] Wise, J., Satellite Imagery, Remote Sensing, and Diminishing the Risk of Nuclear War in South Asia, Special Report no. 434 (United States Institute of Peace: Washington, DC, Nov. 2018), p. 9; and Treaty on Open Skies, opened for signature 24 Mar. 1992, entered into force 1 Jan. 2002.

[99] Zagre and Kilgour, *Perfect Deterrence.*

Conclusion

The quest to maintain strategic stability and an intrinsic desire to influence the entire gamut of strategic stability is a realist thought amply supported by perfect deterrence. Economics, geography, and politics are manifested through hard power, soft power, smart power, and sharp power (all theories and concepts evolved in the last decade) and sufficiently reflect the journey of deterrence from traditional/conventional to nuclear to cross-domains or multi-domains, thus impacting the strategic stability. Recent power contestation in the IOR is an apt example of the interplay encompassing the above factors. World order is being contested, regional order is being evolved and spiraling security dilemma(s) are at play. New concepts of deterrence are impacting strategic stability, which is intrinsically dependent on the latest technologies and capabilities. In the case of developed nations like the US, China, Russia, the UK, and Japan, serious discussions and contemplations are done and new literature is emerging. It is the relationship of the national aims, aspirations, and grand strategy utilising the existing economic power and matching military potential, besides other domains of diplomacy, politics, and information, which in turn is shaping the events. The US-China strategic competition in IOR and Pacific is inherently a security dilemma as Graham Allison[100] has identified it as a full display of the quest for strategic stability, where military (conventional, nuclear, space, cyberspace, information) and non-military domains (economics, political, diplomatic) are at play. A similar analogy can also be partially applied onto India-China strategic competition in the Asia-Pacific and even the IOR. In the case of India-Pakistan, the strategic equilibrium as of now rests on the nuclear capabilities, and classic application of the latest technologies may not be possible, but with the advent of the latest technologies and force modernisation, it will soon become a reality.■

[100] For details see, Graham Allison, *Destined for War: Can America and China Escape Thucydides' Trap*? (Houghton Mifflin Harcourt: Boston, 2017)