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STRATEGIC CULTURE AND TECHNOLOGICAL TRAJECTORIES IN INDIA

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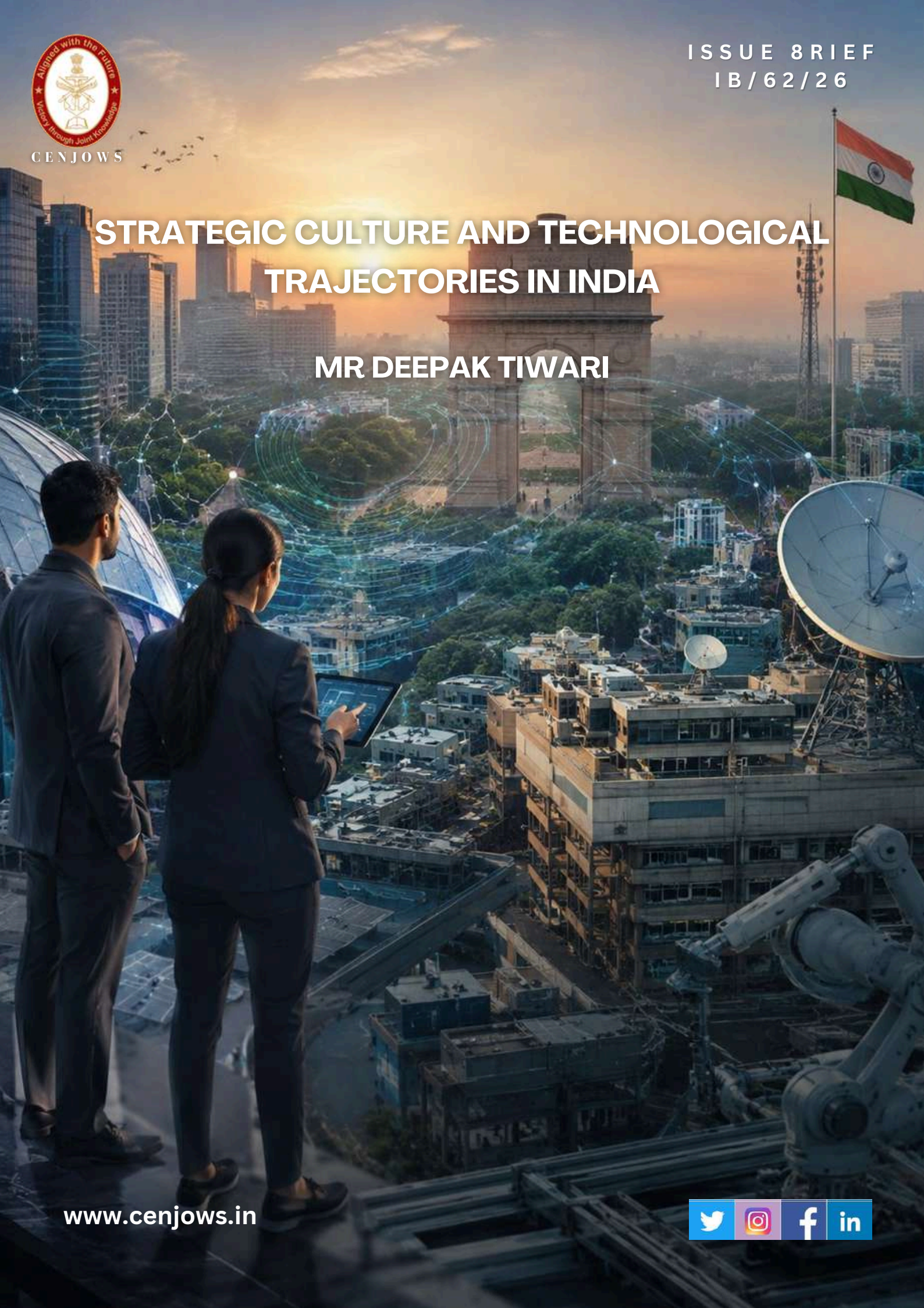

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Strategic Culture and Technological Trajectories in India

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"India has been a reluctant military power. Its strategic choices have always been shaped not just by threats, but by a deep ambivalence about what kind of power it wants to be."

- K. Subrahmanyam, Shedding Shibboleths (2005)[1]

Introduction

The shifting focus and perspectives in geopolitics due to predominant factors or causes over the time have led to the manifestation of different cultures such as political, bureaucratic, strategic and intelligence cultures. In other words, the curves and turns in scholarly discourse over such cultures have a profound impact in shaping the geopolitics of their times. The strategic culture of a nation, the prime focus of this article, often determines how emerging disruptive technologies should be acquired by the military establishment of that nation. Since the cold war, scholars have debated and explored the intersection of strategic culture and technology along with their impact on long term security planning of a nation. One such prominent scholar, Paul Virilio, a French cultural theorist and urbanist says in his book 'Speed and Politics,

"History progresses at the speed of its weaponry". Adding to that, George Orwell, an English novelist, poet and critic notes that "Men are only so good as their technical developments allow them to be". These statements suggest the acceptance of the technological evolution as a complimentary strand of human evolution just like the double helical structure of human DNA. To understand the progress and direction of technology, it is essential to understand the trajectory of innovation, especially in the domain where innovation is critical to survival.[2] Defence innovation has always remained a critical driver of technological evolution of human civilisation, yet the theoretical discourse on its structural framework and functions has little or no depth.

This article argues that India's defence innovation trajectory cannot be understood through the lens of capability gaps or resource constraints alone. It is, at its core, a story of ideology shaping institutions. The post-colonial mindset that India's founding generation carried post-independence was cautious, non-aligned, suspicious of militarism, and consumed by the urgency of development set the parameters within which defence technology policy would operate for decades.[3]

Drawing on the experience of K. Subrahmanyam, Kanti Bajpai, George Tanham, Stephen Cohen, and others, this chapter maps how India's strategic culture influences defence innovation: one that favoured import substitution over original research, licensed production over disruptive development, and bureaucratic control over institutional risk-taking. The result was a defence-industrial base that was, for much of the post-independence period, structurally incapable of genuine technological autonomy even when it claimed to building it.[4]

The chapter proceeds in six sections. It begins by situating strategic culture as an analytical concept and explaining why it matters for understanding technological trajectories. It then traces the intellectual and ideological roots of India's strategic culture in the colonial experience and Nehruvian governance. The third section examines how non-alignment and developmental priorities overshadowed defence spending and innovation. The fourth reconstructs the institutional architecture involving Defence Research and Development Organisation (DRDO), Hindustan Aviation Limited (HAL), the Defence Public Sector Undertakings (DPSUs), that inherited these cultural assumptions. The fifth analyses the failures of specific landmark programmes Tejas, Arjun, IGMDP as cultural and institutional artefacts and

not just technical shortcomings. The chapter concludes by asking what changed, and what has not.

Strategic Culture and Technological Choice: The Analytical Framework

- **What Is Strategic Culture?**

  The concept of strategic culture gained serious traction in the 1970s, largely through Jack Snyder's analysis of Soviet strategic behaviour. Snyder defined it as the sum total of ideas, conditioned emotional responses, and patterns of habitual behaviour that members of a national strategic community have acquired through instruction or imitation. It is a shared set of assumptions about the appropriate force levels and the objectives it should serve.[5] In essence, strategic culture of a nation represents the hope and ambition of the forefathers of our nation who fought the colonisers and made sacrifices to free our nation with the belief that the people of this nation have the potential to take India to its former glory and beyond.

  Since then, the concept has been contested, refined, and occasionally abused. Alistair Johnston's distinction between a "grand strategic culture", the overarching normative framework within which strategy is articulated and operational preferences or tactical doctrines is particularly useful here. For the purposes of this chapter, strategic culture is understood in Johnston's broader sense: the historically grounded beliefs, symbols, and assumptions that shape how a political community defines security threats, calibrates military ambition, and organises the institutions through which it responds to those threats.[6]

  The key analytical move this chapter makes is to link strategic culture not only to force posture and military doctrine but to technological innovation. The argument in this section is that the strategic culture of a nation not only ascribe to the approach with which its forces approach a threat but also how they build the capacity to wage war. Within this context, the relationship between military power, national identity and strategic autonomy builds the foundational understanding for the defence industrial complex involving institutional priorities, funding decisions, timelines, risk tolerances, and definitions of success.[7]

- **The Missing Link: Culture and Defence Innovation**

The majority of existing research studies and overall discourse looks at India's defence innovation performance through a critical lens, highlighting either the technological incapacity or institutional dysfunction. The scholarly work of Laxman Kumar Behera and Deba Ranjan Mohanty have reiterated the structural weakness of DRDO whereas Ajai Shukla and his counterparts have emphasised the setbacks from the delays and cost overruns of many important programs such as Kaveri engine and Tejas.[8] However, a critical outlook of these accounts provides an incomplete picture, no matter however accurate. These arguments detail the symptoms and sometimes the sources, but fails to interlink the underlying structural conditions which fix reasons as to why there are delays and various incompetencies despite the utter criticality looming over as a national security threat. The instances of corruption, bureaucratic inefficiencies and abdication of responsibilities in such critical sector should have been securitised and brought under the internal security issues and thus treated as such.

On a different note, this article makes it contribution, by filling scholarly gap between institutional and cultural divide. The strategic culture which finds its genesis in Kautilya's Arthasastra and an intense patriotic ensemble found during the freedom struggle hides under the weight of untouched files in the government offices. There it waits, till the crisis knocks and then emerges as a "reform" under the political patronage.[9] The "Nehruvian school" as a dominant tradition of Indian strategic decision making saw the pursuit of national power through a worldview which prioritised economic development over military modernisation. As Nehru himself stated in 1947, "The more important thing is that we should develop our country economically and that those who depend on us should not be in a position to threaten us because of our economic weakness".[10] The foundational typology of this approach regarded military spending as both fiscally irresponsible and morally compromised. This world view retained its stint for many decades even after Nehru's death. It found its foster ground in Indian institutions and important offices where decision making was being debated. It gave a distinct form to the existing and evolving

bureaucratic culture of India that governed India's defence sector for the next five decades.[11]

The infamous study by George Tanham in 1992 for RAND Corporation titled “Indian Strategic Thought: An Interpretive Essay”, claimed that India lacks a coherent strategic culture. The argument he made was, in a way, highlighted the lack of attention given to development of military capabilities, suggesting that India’s political elites had never emphasised the pursuit of national interests as a direct function of military power.[12] Although, Tanham’s remarks received a sharp rebuttal from many contemporary Indian scholars including K. Subrahmanyam and Atal Bihari Bajpai himself, he triggered a scholarly consolidation of various accounts of India’s strategic thought from ancient history to post independence. K. Subrahmanyam in particular, said that Tanham’s confusion emanated from the absence of Western-style strategic doctrine, was a reflection of his remarks on India’s strategic thinking.[13] However, Tanham did struck the nerve by pointing out something real, an institutional culture where military needs and demands were consistently being overlooked to serve other priorities. It was also visible in India’s global posturing, which was characterised by an intentional reluctance to power projection and building a reactive rather than anticipatory stance to ensuing threats.

The Colonial Inheritance: Trauma, Caution, and Anti-Militarism

- **The Weight of Colonial Memory**

  To understand the post-independence strand of Indian’s strategic culture, one has to travel nearly 200 years back in the time when colonial subjugation took its roots. The British had clearly demonstrated that military power is the only way to gain absolute domination over territory. They established the power of a big navy, lesson well taken by the American in the later years. For two centuries, India fought for freedom from suppression, witnessing the application of state power and coercive forces against Indians. The impact of this strategy applied was clearly in display in consonance with Mao Zedong who said in 1927, "political power grows out of the barrel of a gun."

This shaped the moral framework within which India's founding leaders approached the question of national defence. Mahatma Gandhi's philosophy of non-violence was, of course, its most extreme expression and Gandhi were not a defence planner. But the cultural residue of Gandhian thought permeated the Congress movement more broadly, establishing a reflexive discomfort with military power that went beyond pacifism and became, in the hands of Nehru, an explicit component of foreign policy.[14]

At the same time, the colonial period left another legacy that pulled in a different direction: the memory of military humiliation. The 1857 uprising, and its brutal suppression, the selective use of Indian soldiers in Britain's imperial wars, and the systematic underdevelopment of an indigenous defence-industrial base all of this produced, alongside the anti-militarist impulse, a parallel anxiety about vulnerability. India's founders wanted to be militarily independent precisely because they had seen what military dependence looked like under colonial rule.

These two impulses, anti-militarism and anxiety about vulnerability are not contradictory. They are the twin pillars of what K. Subrahmanyam described as India's "restrained militarism": an approach to national security that acknowledged the necessity of military power without ever fully embracing self-reliance in defence without the political will to invest what self-reliance actually required.[15]

- **Nehru's Synthesis: Moralism, Development, and Strategic Ambiguity**
  Jawaharlal Nehru was not, as his critics sometimes suggest, naive about power. He read Realpolitik. He admired the Arthashastra. He was, in K. Subrahmanyam's description, a practitioner of "Realism-plus", someone who combined a hard-headed assessment of national interest with a genuine commitment to democratic and anti-colonial values.[16] But Nehru's synthesis also contained a structural tension that would haunt India's defence planning for decades.

  Deepak Nayyar and other economic historians have documented how Nehru's developmental project was, above all else, about the transformation of India's

economic base. The heavy industrialisation model steel, dams, public-sector enterprises was not merely an economic strategy. It was a statement of sovereign ambition. [17]

As mentioned in above sections, deeply influenced by neoliberal ideas, Nehru, as noted by many scholars, deliberately kept the defence spending low as a part of the national income. Sumit Ganguly and Manjeet Pardesi have consistently documented through their scholarly work, as to how defence spending as a percent of GDP was kept below 1.7%, which was quite insignificant considering India's modernisation needs dragged by the WW2 era equipment.[18] The subsequent non-alignment posture as a doctrine of foreign policy reinforced this logic. The logic was that if India keeps itself away from formal superpower politics, it will not have to participate in the arms race.

"One of the key elements of the doctrine of nonalignment was the limitation of high defence expenditures. Nehru believed that aligning with either bloc would compromise India's autonomy and its development priorities".

- Sumit Ganguly, 'Explaining Sixty Years of India's Foreign Policy' (2010)

The 5 principles of Peaceful Coexistence laid down in the diplomatic guidelines of Panchsheel were, among other things, to construct a regional security environment that would reduce the demand for military spending. The consequences of this approach became starkly visible in October 1962.[19] The Sino-Indian War was not simply a military defeat. It was an epistemological shock a brutal refutation of the Nehruvian assumption that moral diplomacy and economic development could substitute for military preparedness. India's troops were under-equipped, the supply lines underdeveloped, and its intelligence apparatus badly mistaken about Chinese intentions. The humiliation reoriented India's defence priorities in the short term but did not fundamentally displace the cultural assumptions that had produced the vulnerability in the first place.[20]

- **Impact of Non-Alignment on Defence Innovation**

  The relationship between non-alignment and defence innovation is rarely examined directly, but it is central to this chapter's argument. Non-alignment was a geopolitical doctrine, but it also had a set of technological implications that are worth analysing.

  First, non-alignment placed India in a structurally awkward position with respect to technology transfer. Both superpowers used arms sales and technology sharing as instruments of alignment. Access to advanced military technology was, in the Cold War world, essentially a reward for strategic partnership.[21] India's deliberate refusal to join either bloc while pragmatically acquiring from both meant that it typically received technologies that were one or two generations behind the cutting edge, and always with strings attached. For example, the conditions on which Soviet weapons were sold required the spare parts and technical personnels to be sources from the USSR authorised vendors only. This led to cascading dependencies with the appearance of being self-reliant.[22]

  Second, non-alignment gave a strong ideological support to the political salience over domestic industrial base because, within that paradigm, it was unwise to fully trust a superpower as a long-term supplier. It also defeated the purpose of non-alignment. The problem that surfaced in time was that the commitment to indigenisation became more rhetorical than structural.[23] The reason was, because it was designed to serve the policy and political aspiration and had no institutional backing through strategic investment and human capital.

  Third, and perhaps most importantly, the culture of ‘strategic ambiguity’ around threat assessments that was created by the non-alignment policy. In the absence of clear alignment and favours, it was difficult to identify different threat scenarios where different strategic procurements plans would be needed. Simply put, it was hard to ascertain which weapon to get, why and what future threat it will be able to handle.[24] This ambiguity led an absence of scope and purpose in the budding institutions like HAL and DRDO.

Restrained Militarism: The Concept and Its Manifestations

- **Unpacking Subrahmanyam's Concept**

  Restrained militarism, in Subrahmanyam's framework, explains why India pursued nuclear weapons covertly for decades before testing them openly. It explains the explicitly defensive nature of India's military doctrine in the post-independence period. It also explains why India did not chose to invest in disruptive and futuristic technologies that would have granted a strategic edge in the battles it was destined to fought.[25] This would have required a sustained institutional risk taking and a huge defence R&D expenditure. It was not that India did not have capability of such investments and research and development initiatives. Subrahmanyam was not using the term disparagingly. He saw restrained militarism as a rational, even admirable, response to India's strategic condition. India, to him, was a country that faced genuine threats, that needed credible deterrence, but that was also constrained by developmental imperatives and a political culture uncomfortable with the open exercise of military power.[26]

- **Three Schools of Thought, One Dominant Trajectory**

  Kanti Bajpai's typology of Indian strategic thought identifies three distinct schools, Nehruvian, Neo-liberal Realist, and Hyperrealist. Each has different implications for defence innovation.

  The Nehruvian school, dominant until the late 1980s, prioritising economic development over military modernisation. Its approach to defence technology was essentially instrumental in suggesting to build what was must to deter, but do not let defence spending overshadow development priorities.[27] This school was represented in practice by leaders like Nehru, Indira Gandhi (in her early years), and Rajiv Gandhi and institutionally by the Planning Commission's consistent prioritisation of civilian over military investment.[28]

  The Hyperrealist school represented by Bharat Karnad and, in different ways, by the nuclear hawks of the 1990s, argued that India needed to project power openly, develop next-generation military technologies, and shed what Karnad called the "nuclear pacifism" that had prevented India from fully leveraging its

strategic capabilities.[29] This school remained a minority view for most of the post-independence period.

The Neo-liberal Realist school, whose intellectual lineage runs through C. Raja Mohan and others, sought to combine strategic ambition with economic pragmatism.[30] It advocated defence modernisation through international partnerships, technology transfer, and market-based procurement, the intellectual antecedent to what would become the Atmanirbhar Bharat approach under Modi.

The critical observation for this chapter is that the dominant trajectory of India's defence innovation the one that actually shaped institutions and spending was Nehruvian. And the Nehruvian approach, however internally coherent, was fundamentally conservative in its technological ambitions. It sought adequacy, not superiority. It invested in import substitution, replacing what India was buying abroad with domestically produced equivalents, rather than in the kind of original, disruptive research that could leapfrog generations of technology.

- **Import Substitution vs. Disruptive Innovation: A Critical Distinction**

The distinction between import substitution and disruptive innovation is central to this chapter's argument, and it deserves careful elaboration.

Import substitution, in the defence context, means producing domestically what was previously imported. It is a legitimate and often necessary first step in building an industrial base. Israel, South Korea, and Brazil all went through import-substitution phases before developing genuine indigenous innovation capacity. The problem is not importing substitution per se but the conditions under which it occurs and whether it is treated as a transitional strategy or a permanent goal.

India's defence-industrial model, as it evolved from the 1940s through the 1990s, treated import substitution essentially as a permanent goal.[31] The Defence Public Sector Undertakings (DPSUs) were designed to produce specific systems that India was importing not to develop new ones. DRDO was structured to reverse-engineer and incrementally improve foreign designs

rather than to pursue original research. HAL's early decades were defined by licensed production of British, French, and Soviet aircraft, a model that built manufacturing capacity but not design capability.[32]

Disruptive innovation, by contrast, requires a different institutional culture: one that tolerates failure, rewards risk-taking, allows competitive procurement, and is willing to make long-term bets on technologies whose military applications may not be immediately obvious. This kind of innovation culture was absent from India's defence establishment for most of the post-independence period not primarily because India lacked the technical talent (it demonstrably did not), but because the cultural and institutional framework in which defence R&D operated was not designed to produce it.[33]

"In 1995, a ten-year plan was conceived to increase self-reliance in production from 30 to 70 per cent. But fifteen years later, the dependence on imports was still 70%."

- Deccan Herald, 2010, citing DRDO's own targets

The Institutional Architecture of Strategic Caution

- **Building Institutions to Reflect Culture**

  Institutions are not neutral. They crystallised ideology, the organisational forms that a political culture chooses to embody its priorities and assumptions. India's defence-industrial institutions were built, from the outset, to reflect the values of the Nehruvian consensus: public-sector primacy, civilian control, planned production, and import substitution as the goal.

  The 1956 Industrial Policy Resolution, which reserved defence production for the public sector and effectively excluded private enterprise from the defence-industrial base for the next four decades, was not simply an economic decision. It was a political statement about the kind of defence sector India wanted to build one insulated from the profit motive, controlled by the state, and oriented toward national sovereignty rather than market competition.[34] The

consequences of this choice reverberated through India's defence-industrial base for decades.

- **DRDO: The R&D Institution and Its Cultural Constraints**

  The Defence Research and Development Organisation was established in 1958, consolidating a number of existing technical laboratories. In its early years, DRDO operated largely as a support organisation for the armed forces solving immediate operational problems, testing imported equipment, and providing technical advice. The ambition of original R&D came later, and was always in tension with the structural realities of the organisation.[35]

  Two structural features of DRDO deserve particular attention. First, DRDO operated within a bureaucratic culture in which risk-aversion was rational. Scientists and engineers who proposed ambitious projects that subsequently failed faced career consequences; those who proposed incremental improvements to existing systems were on much safer ground. This created a systematic bias toward conservative, low-risk work, the opposite of what disruptive innovation requires.[36]

  Second, DRDO's relationship with the armed forces was characterised by mutual suspicion for much of the post-independence period. The services, conditioned by decades of importing high-quality foreign equipment, were sceptical of domestically developed systems. This scepticism was not always unfair many indigenous programmes did suffer from capability gaps but it created a vicious cycle in which the services refused to champion DRDO's programmes, DRDO lacked the operational feedback needed to improve its designs, and both sides defaulted to the comfort of foreign procurement.

  The Parliamentary Standing Committee on Defence captured this dynamic in one of its more direct assessments: "The delays in development of weapon systems MBT Arjun, LCA, etc. not only caused significant loss of revenue but also delayed the timely procurement of weapon systems from foreign sources. The delays cause suspicion on the capability of DRDO in the eyes of the users".[37] The Committee's language is careful, but the diagnosis is clear: the

institutional relationship between DRDO and the services was broken, and the cultural assumptions on both sides contributed to the breakdown.[38]

- **HAL and the Licensed Production Trap**

  Hindustan Aeronautics Limited presents a particularly instructive case of what happens when an institution is structurally designed for licensed production rather than original design. HAL was established in 1940, nationalised in 1964, and for much of its history derived the bulk of its work from assembling or manufacturing foreign designs under licence, first British (Gnats, Hunters), then Soviet (MiG series), and eventually as a partner in joint development programmes.[39]

  The licensed production model was not without value. It built manufacturing capacity, trained engineers, and created supply chains. But it also created what economists call a "learning trap": an institution that became highly competent at a particular activity (assembling foreign designs) and therefore had both reduced incentive and reduced institutional capacity to develop the different skills required for original design.

  A 2011 report by the Comptroller and Auditor General of India documented that HAL's import dependency for raw materials and bought-out items in its indigenous programmes was as high as 90 percent.[40] The figure was particularly striking given that the programmes in question, including the Tejas LCA, were officially designated as "indigenous." It revealed the gap between the symbolic politics of self-reliance and the technological reality of continued dependence.[41]

- **The Private Sector Exclusion**

  Perhaps the most consequential institutional decision in India's defence-industrial history was the near-total exclusion of the private sector until 2001. The 1956 reservation of defence production for public-sector enterprises was maintained, with only minor modifications, for four and a half decades. This was not simply a fiscal or economic choice. It was a cultural one, rooted in the

Nehruvian suspicion of private capital, the fear of profit-driven priorities distorting defence requirements, and a deep-seated assumption that only state enterprises could be trusted with national security technology.

The consequences were profound. India's vibrant private sector which by the 1990s included world-class engineering firms, sophisticated IT companies, and internationally competitive manufacturers was systematically excluded from the sector where innovation was most urgently needed. The Tatas, L&Ts, and Mahindras that would eventually transform Indian defence manufacturing in the 2010s were kept at arm's length for decades. The human capital, organisational dynamism, and competitive incentive structures that India's private sector had developed in civilian industries did not flow into defence R&D.

The comparison with Israel, South Korea, and even Brazil is instructive. All three countries built successful defence-industrial bases that combined public-sector coordination with private-sector competition and innovation. Israel's defence industry Elbit, Rafael, IAI, is explicitly structured around competition between private and state enterprises. South Korea's DAPA procurement framework intentionally creates competitive pressure among domestic contractors. India, by contrast, maintained a monopoly model that insulated public-sector enterprises from competitive pressure and, in doing so, removed the most powerful driver of innovation.

Programmes as Cultural Artefacts: Tejas, Arjun, and IGMDP

- **Reading Programmes as Policy**

  Defence programmes are not merely technical undertakings. They are political and cultural statements commitments about what a country values, what it believes it can achieve, and how it manages the relationship between ambition and capacity. When India launched the Arjun Main Battle Tank in 1974, the Light Combat Aircraft programme in 1983, and the Integrated Guided Missile Development Programme (IGMDP) in 1983, it was making claims to its own citizens, to its strategic community, and to the world about its ambitions as a technological power.[42] The gap between those claims and the reality of what

was delivered is not simply a story of technical failure. It is a story of cultural and institutional contradictions that the programmes could not resolve.

- **The Tejas LCA: Ambition Without Architecture**

  The Light Combat Aircraft programme is perhaps the most studied example of India's defence innovation dilemma, and for good reason. Conceived in the late 1970s, formally sanctioned in 1983, it was supposed to replace India's ageing MiG-21 fleet with an indigenous, fourth-generation fighter within a decade. The timeline was visibly unrealistic, and it remained unrealistic for the next three decades.[43]

  The Tejas finally received Initial Operational Clearance in January 2011, twenty-eight years after programme sanction. Full Operational Clearance came in 2019 thirty-six years after the programme began. When the CAG reviewed the Tejas Mk-I, it found fifty-three significant capability shortfalls, noted that indigenous content was 35 percent rather than the claimed 70 percent, and observed that the IAF had been forced to spend Rs 20,037 crore upgrading ageing Soviet aircraft specifically because of Tejas delays. The programme had begun with a projected cost of Rs 560 crore. By 2013, when the aircraft still had not been inducted, the development cost alone had exceeded Rs 7,965 crore.[44]

  What explains this trajectory? The technical challenges were real, designing and integrating a modern combat aircraft involves thousands of interdependent engineering systems, and India genuinely lacked some of the enabling technologies when the programme began. The 1998 nuclear tests and subsequent sanctions cut off access to critical components, extending timelines further. But the institutional and cultural explanations are at least as important as the technical ones.

  The frequent revision of General Staff Qualitative Requirements (GSQR) the operational specifications that defined what the aircraft needed to do reflected the absence of clear strategic doctrine and the strength of inter-service politics over systematic planning. The fragmented programme structure, with ADA, HAL, DRDO, and the IAF all playing partially overlapping roles without clear

accountability, reflected the institutional culture of distributed responsibility and avoided political conflict that characterised India's defence bureaucracy.[45] The persistent inability to develop a credible indigenous engine the Kaveri project, which consumed decades of R&D investment before being effectively abandoned reflected the gap between the symbolic politics of self-reliance and the sustained institutional investment that genuine technological independence requires.

"Three decades after it received the government's approval, Tejas is still not a part of the Indian Air Force inventory, though recently it flew in an IAF exercise at Pokhran... The estimated project cost was Rs 560 crore. But the government has so far spent Rs 7,965 crore."

- Deccan Herald, June 2013

- **The Arjun MBT: When Requirements Moved Faster Than Technology**

  The Arjun Main Battle Tank tells a slightly different story one in which the institutional dysfunction was located less in the R&D organisation and more in the client, the Indian Army. The tank programme, begun formally in 1974, was repeatedly set back by the Army's changing and escalating operational requirements. When the programme began, the requirement was for a tank with a 105mm gun. As development stabilised, the requirement shifted to 120mm, a change that required essentially rebuilding the platform's structural architecture from scratch.[46]

  The pattern of changing requirements is itself a cultural symptom. It suggests that the premier military institutions had not internalised the fact that development programmes of a vital piece of weaponry require stable requirements over long timescales. Also, the fact that the changing specifications mid-stream does not "improve" a programme, it terminates and restarts it and hence the long delays occur which leave the country defenceless against counterthreats. It also reflects the services' deep ambivalence about domestic development, which have been reiterated in many studies. An implicit preference shown for importing proven foreign systems, although was never

openly stated, but was consistently expressed through the generation of requirements that domestic developers could not meet.[47]

This notion was well found after the Arjun was inducted eventually. Although, it performed well in trials, but by then the Army had already committed to large numbers of Russian T-90 tanks.[48] On a different note, the indigenous content of Arjun tanks at induction was around 31 percent, that too after a long development cycle by DRDO. Figures like these and the Tejas, exposed the gap between the rhetoric of self-reliance and the reality of technological dependence.[49]

- **The Integrated Guided Missile Development Programme (IGMDP): The Success Story and Its Limits**

  The IGMDP was sanctioned in 1983 under the direction of A.P.J. Abdul Kalam. Till this date, it is often regarded as India's most significant defence R&D success. In many ways it was a success beyond the situation of that time allow to imagine. The programme produced the Prithvi, Agni, Trishul, Akash, and Nag missile systems. Prithvi missile system achieved operational status in the early 1990s and the Agni series eventually formed the backbone of India's nuclear deterrent.[50]

  IGMDP, although echoes the success story of India’s potential and resilience against the changing geopolitical scenery, it requires a careful interpretation. It was programmed to provide a strategic deterrence through missiles and not intended to produce platforms. It’s aim sat within the tradition of restrained militarism. The political cost of gaining a credible minimum deterrence was low which was calculated carefully under the Nehruvian cultural framework. The otherwise cost of projecting conventional power was neither within the scope of the political will, nor it was easy amid the ongoing border tensions and internal security issues.

  Moreover, IGMDP had found an unusually strong political backing, and with Rajiv Gandhi government’s willingness and the charismatic scientific leadership of Dr. Kalam, it found a well-defined set of technical objectives.[51] These

conditions favouring IGMDP were exactly what the India’s defence R&D ecosystem was lacking. This program proved that there were no fundamental constrains to India’s R&D prospects but the counterwave of India’s strategic approach, a cultural short-sightedness.

Threat Perception, Political Ideology, and Technological Ambition

- **The China Shock and Its Incomplete Lessons**

  The Sino-Indian War of 1962 had a profound impact on India's threat perception but somehow there was no alteration in its strategic culture. In the immediate aftermath, defence spending increased sharply from around 1.7 percent of GDP to nearly 4 percent by 1963-64. The Army was expanded and re-equipped. DRDO's mandate was broadened. But the cultural and institutional assumptions that had produced India's pre-1962 vulnerability were not interrogated with anything like the same urgency.

  The reason, arguably, was that 1962 was interpreted primarily as a failure of diplomacy and intelligence, not as a failure of strategic culture. Nehru's personal authority meant that the institutions he had built the Planning Commission's primacy, the subordination of defence to development, the anti-militarist strain in government culture, survived largely intact even as the specific policies they had produced were revised. The lesson India drew from 1962 was that it needed more and better military equipment. It did not draw the more profound lesson that the institutional culture within which defence technology was developed needed to change.[52]

- **Pakistan and the Two-Front Dilemma**

  India's threat perception has always been shaped by Pakistan and China and the strategic logic of the two-front dilemma has had specific implications for defence technology priorities. The challenge is that Pakistan and China require fundamentally different military responses. Pakistan requires conventional superiority in land warfare and deterrence at the sub conventional level. China requires long-range power projection, advanced air capabilities, and strategic deterrence.[53]

These differing requirements should have, in theory, generated a clear force structure and a corresponding technology development agenda. In practice, they generated ambiguity and competition for resources. The Army's focus on the Pakistani threat tended to crowd out investment in the technologies needed to match China advanced fighter aircraft, precision strike, space-based intelligence because the Pakistan-oriented operational culture prioritised the conventional ground forces that dominated the Army's budget.

Subrahmanyam argued throughout his career that India consistently under-invested in the China-facing dimensions of its military technology prioritising the Pakistan problem because it was more immediate and more tractable, while treating the China problem as long-term and therefore deferrable.[54]

- **The Nuclear Programme: Restraint as Strategy**

  India's nuclear weapons programme offers, paradoxically, the clearest illustration of how restrained militarism shaped technological ambition. The first nuclear test India conducted in 1974, was named "Peaceful Nuclear Explosion", it was a deliberate expression and a signal to China and Pakistan. After that, India waited twenty-four years before testing again. In the intervening period, a posture of deliberate ambiguity, as mentioned earlier, was kept by neither confirming nor denying a weapons programme.[55]

  The 1974 test was as much an expression of technological capability as a reluctant concession to strategic necessity. The decision to test in 1998 was driven partly by BJP's more explicitly nationalist strategic culture. Yet, the declared doctrine of "No First Use" and "minimum credible deterrence" was framed carefully within the language of restraint. According to George Perkovich's landmark study summarised in a book titled, India's Nuclear Bomb (1999), documents in careful detail the political and cultural pressures that shaped this trajectory. The restraint was genuine not merely tactical. According to him, a large sections of India's political elites and institutional heads, including several Prime Ministers, were genuinely uncomfortable with open nuclear weaponisation.[56]

India's strategic culture did not simply block technological development. It shaped and directed it. The skilled talent of the nation employed at various top tier institutions such as BARC and DRDO was focused on the technologies which could be justified by the dominant strategic culture of India. The fact that the restrained, non-aligned and defensive approach seeped into the decision making, had a lasting impact on India’s defence planning which included scope of innovation.[57] The evolving doctrine of deterrence was acceptable through missiles but it was not accommodating to advanced conventional platforms. The result was a distinctive technological profile: credible in strategic deterrence, lagging in conventional platform development.[58]

Conclusion: What Changed, and What Has Not

- **The Continuity Beneath the Change**

  Since 2014, India has launched a series of ambitious initiatives to transform its defence-industrial base to Make in India, the Positive Indigenisation Lists, the creation of Defence Industrial Corridors in Uttar Pradesh and Tamil Nadu, the liberalisation of FDI in defence, and the establishment of iDEX (Innovations for Defence Excellence) to bring startups into the defence ecosystem. The numbers, at least in some dimensions, have been striking. Domestic defence production reportedly rose from 30-35 percent of procurement in 2014-15 to 65 percent in 2024-25, with production reaching Rs 1.27 lakh crore in FY 2023-24.[59]

  But the DRDO's share of the defence budget remains around 3-4 percent of total spending. India's overall R&D expenditure as a share of GDP approximately 0.7 percent is far below China's 2.4 percent or South Korea's 4.8 percent. The Kaveri engine remains un-operational. The AMCA (Advanced Medium Combat Aircraft) programme is in early development. And the distinction between production and innovation between assembling foreign designs domestically and developing genuinely new technologies remains as relevant as it was in 1983.[60]

- **Strategic Culture in Transition**

  There are genuine signs that India's strategic culture is evolving. The shift from non-alignment to what S. Jaishankar calls "multi-alignment", India's current foreign policy framework is not merely a rhetorical change. It reflects a genuine reassessment of how India should manage its security interests in a multipolar world. The growing openness to US-India defence technology cooperation, the co-development projects with Israel and France, and the explicit framing of self-reliance as a prerequisite for great-power status rather than merely a socialist aspiration, all suggest a strategic culture in transition.

  But strategic cultures change slowly. The institutional habits, bureaucratic incentive structures, and cultural assumptions that were built over fifty years of Nehruvian defence planning cannot be transformed in a decade. What the Modi era has done, most significantly, is change the political framing of defence technology making indigenous development an explicit marker of national identity rather than merely an economic or security objective. This change in framing will eventually generate the institutional transformations needed for genuine disruptive innovation remains one of the central strategic questions facing India today.

Declaration

I declare that this manuscript is being submitted exclusively to CENJOWS for publication consideration, is original, and has not been published or submitted elsewhere. I further certify that it contains no classified, restricted, or sensitive information and is based entirely on open-source material suitable for publication in the public domain.

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