India’s Jet Engine Dependencies: A Structural Problem

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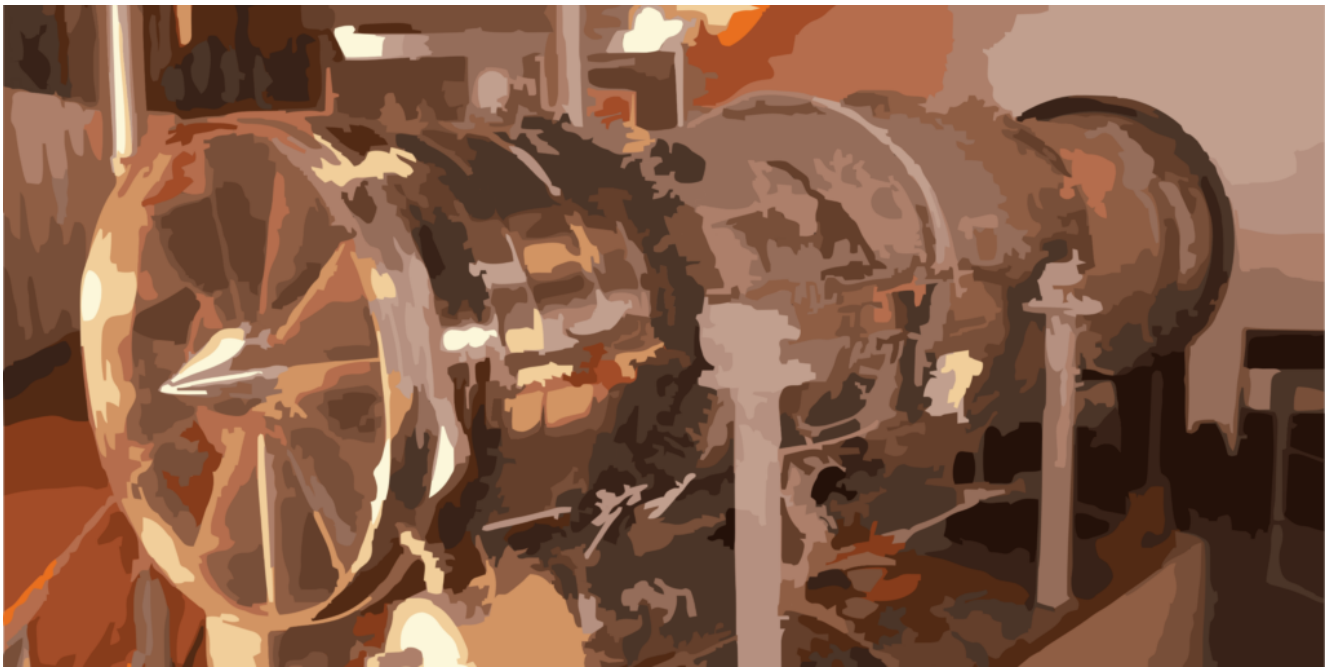

Parallel issues have stalled progress in India’s jet fighter programs. As reported, the GE-F414 engines that India wanted to power its planned 5th– generation stealth aircraft, AMCA, and the Tejas Mk2 (version 2.0 of the Tejas), will be supplied to India at an inflated price, three times the initial offer. According to officials familiar with the negotiations, the “landmark deal” signed in 2023 during PM Modi’s US visit encountered difficulties. Negotiations regarding technology transfer, assembly-line setup, and the manufacturing supply chain for co-production and co-manufacturing of GE engines in India proved challenging to finalize.

The deal could easily be categorized as part of New Delhi’s offset strategy. The Indian government had requested an additional 99 GE F404 engines in 2021, and as part of that financial transaction, India demanded that GE establish engine manufacturing in India. Furthermore, India’s decision to sign

a USD 1 billion deal for an additional 113 F404 engines in 2025 was not merely an off-the-shelf purchase. It should also be interpreted within India's broader acquisition strategy: to leverage this purchase and negotiate a meaningful technology transfer for India regarding GE F414 engines.

However, this did not work out in India's favor. Moreover, GE has reportedly suggested a substantial Indian investment, amounting to USD 800 million, to establish an assembly line or manufacturing capability with only about 80% ToT to India and no intellectual property control over the engine technology. In other words, even after incurring high financial costs, India would still fall short of developing its own independent propulsion technology.

This situation also illuminates another aspect of the broader trend in India-US bilateral ties: the US is increasingly taking India's concerns and interests for granted, overlooking pain points that could exacerbate already tense relations. This new issue—alongside recent developments such as the killing of three Indian sea mariners by the US Navy; the June declaration by the US Congress expressing concerns over India's FCRA rule on Christian missionaries; the decree to impose 12.5% tariffs on India over the exploitation of labor laws in the supply chain; as well as the yet-to-be-concluded US trade deal—highlights an emerging pattern of drift in India-US relations.

Moving forward, India faces difficult choices with few workarounds. GE F414 engines will power India's Tejas Mk2, AMCA Mk1, and the Indian Navy's Twin-Engine Deck-Based Fighter (TEDBF). This is a stopgap measure until India's ambitious independent propulsion capability achieves fruition, which will power the remaining AMCAs and TEDBFs.

Locked Into a Single Supplier

The problems are now twofold, and both are acute for Indian

defense planners. GE's leverage over India is obvious: New Delhi has designed the Tejas and AMCA variants according to specifications and parameters that can only incorporate a GE engine. Therefore, India cannot simply nullify its contract with GE to consider other engine manufacturers, even when reports suggest India is exploring other options.

An unverified source suggested the possible alternative of retrofitting AL-31FP engines for the Tejas aircraft ("suboptimal thrust levels"), produced at HAL's licensed assembly plant at Koraput. However, this does not mitigate India's vulnerability, as the remaining programs are highly dependent on GE engines.

Furthermore, GE's push for USD 800 million Indian investment in manufacturing or assembly lines seems a poor option for India. While it would certainly fulfill India's fighter jet demand (Tejas and initial AMCA variants), it contributes little to building India's own independent propulsion capability. This is because the engine is licensed for production in India without any diffusion of proprietary knowledge, thereby enabling India to leap into engine development.

GE's past experiences with ToT and licensed production also suggest that the company guards its proprietary knowledge zealously. Under the FX2 program with Japan in the 1990s, despite Japan's financial investment, reciprocal patent sharing with Washington, and political commitment, GE agreed to only 80% of phased license manufacturing with Japan. The experience of South Korea's program also suggests a similar pattern.

So, with GE's recent changes in pricing and ToT demands, India must bear an enormous financial cost (due to GE F414 engines) and invest in assembly manufacturing that is inadequate at transferring the "know-why" of engine-making to Indian engineers. India, therefore, will be without any

engine-making capability even after the GE agreement concludes.

Friction Without a Fracture

Any fallout now would also further reinforce the viewpoint that India-US defense ties are faltering. These ties have weathered much of the India-US bilateral drift in other aspects of the partnership, including trade deal negotiations, Trump's tariff imposition, US Congress complaints about India's FCRA, and other such pain points.

For the past year or so, India-US defense ties have progressed despite bilateral fissures. Both countries conducted their annual, complex, and integrated joint exercises (Tiger Triumph April 2025, Yudh Abhyas November 2025), enhanced maritime security (US supplied India with Sea Vision Software), engaged in military sales (US sold India 100 Javelin anti-tank missiles and precision-guided artillery rounds), and continued high-level routine bureaucratic dialogues (US Indo-Pacific Command officials visited India; Indian military chiefs visited the US). All of these suggest that military and maritime domain activities have continued despite divergences at leadership levels.

Moreover, amid the GE-related issues, the US has acceded to India's request to provide sustainment packages and support for its fleet of Apache attack helicopters and the M777 ultra-light howitzers. The latter played a vital role in Operation Sindoor in May 2025. Some may argue that the US is overlooking India's security predicament vis-à-vis Pakistan and China by complicating the GE issue. But the recent story of sustainment packages averts the perception of the US abandoning Indian concerns.

Amidst the GE fallout, the US may have arrested a broader deterioration in India-US defense ties by acceding to India's request mentioned above. This could be interpreted as a US

attempt to assuage Indian concerns while safeguarding its own strategic interests, thereby challenging the broader perception of US unreliability.

The Long Road to an Indigenous Engine

GE's price escalation, however, may further embolden the Indian government's determination to acquire an independent propulsion capability. India is already making strides through the AMCA Mk2 and TEDBF programs. For these programs, India will finalize either Safran or Rolls-Royce to build the indigenous engine under a Strategic Partnership (SP) model that will involve risk-sharing, equity stakeholding, and IP control within India.

Based on past analyses of Indian defense procurement, the SP model is better suited to transferring tacit knowledge (the "know-why of capability) than licensed production models (which only impart the "know-how"). On the manufacturing side, HAL was excluded from the RFP issued in May 2026, suggesting that the selected consortium of private firms (excluding Tata) faces a steep learning curve before it can assume the role of system integrator—a capability that HAL already possesses but which will now be underutilized. Such an approach may delay the rollout of these programs, but will ultimately foster a more competitive defense-industrial ecosystem in India.

While the GE issue has emerged as a source of irritation in the otherwise robust India-US defense relationship, its timing has amplified perceptions of US unreliability in India's strategic calculus. It came on the heels of the US Navy firing a Hellfire missile at a commercial merchant vessel, killing three Indian mariners. Nonetheless, the significance of the GE engines lies in addressing India's strategic capability deficit vis-à-vis both Pakistan and China—a concern that would become considerably more acute if this deal ends up in a deadlock.

Furthermore, the failure to conclude a deal with GE will reinforce perceptions of US unreliability, despite the US remaining a major contributor to India's defense capability development and modernization. India's policy of reducing its dependence on Russian military equipment in favor of US and other Western suppliers may come under strain during the current crisis. Nevertheless, the dispute is unlikely to trigger any major changes in India-US defense ties, which have remained largely unscathed despite the broader downturn in bilateral relations since Trump's second administration.

With respect to India's indigenous engine-development capabilities, progress on the Kaveri engine has stalled due to engineering difficulties. Nevertheless, the Gas Turbine Research Establishment (GTRE), a DRDO laboratory that designs fighter jets, will continue to invest resources, workforce, and capabilities to fine-tune the engine's parameters. GTRE aims to validate 83 kilonewton Kaveri engines by the 2030s. Although this thrust level is significantly lower than that of comparable Safran or Rolls-Royce engines (100-130 kilonewton), GTRE's collaboration with both manufacturers would enable India to acquire essential design and engineering know-how that could subsequently be applied to the Kaveri program, thereby enhancing its prospects of success. Even so, achieving parity with leading international engines is likely to remain decades away.