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INDIA-US JET ENGINE DEAL AND ITS SIGNIFICANCE FOR AATMANIRBHAR BHARAT

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The long wait of more than ten years seems to have ended with India and the US signing the much-awaited defence agreement to support the state-run Hindustan Aeronautics Limited's (HAL) partnership with American company General Electric (GE) for jointly producing indigenous fighter jet engines.[1] In order to strengthen and broaden bilateral strategic technology partnerships and defence industrial cooperation between the governments, companies, and academic institutions of the two countries, US President Joe Biden and Indian PM Narendra Modi announced the US-India Initiative on Critical and Emerging Technologies (iCET) in May 2022. As a follow-up of the strategic initiative by the two heads of state, the main focus of National Security Advisor (NSA) Ajit Doval's discussions with his American counterpart Jack Sullivan in February this year, when they also operationalised the US-India iCET, was the Transfer of Technology (ToT) for jet engines.

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The Plan and Process

One of India's enduring challenges in military and civil aviation has been the inability of Indian industry and research agencies to design and produce an indigenous jet engine. Jet engine technology has been more closely guarded by nations and their corporations than even nuclear reactor know-how. Jet engines are famously complex machinery, containing at least 30,000 moving and static parts and requiring high-end metallurgy

research as well as a very high degree of precision and skill in forging, casting, and machining. The big three jet engine manufacturers, viz., Rolls Royce, Pratt and Whitney, and General Electric, have always kept the design a closely guarded secret. The US, France, the UK, and Russia are the only countries that have such capability, and no other country, including China, has been able to develop jet engines on its own.

The long-term plan in India for the next 30 to 40 years is to develop more advanced aircraft like the Tejas Mk-II, Advanced Medium Combat Aircraft (AMCA), and the indigenous Twin Engine Deck Based Fighter (TEDBF) for the Indian Navy (IN) towards replacing the ageing M-2000 and MiG-29s.

In India, in August 1983, the indigenous Light Combat Aircraft (LCA) Tejas project was approved with an initial cost of Rs 560 crore to replace ageing MiG-21s.[2] For almost 30 years thereafter, the Gas Turbine Research Establishment (GTRE) of India's Defense Research and Development Organization (DRDO) struggled to produce aero engines for the LCA.[3] An Indian design, the *Kaveri* engine was originally intended to power production models of the LCA and was being built by the Aeronautical Development Agency (ADA). However, the *Kaveri* programme failed to satisfy the necessary technical requirements or keep up with its envisaged timelines and was officially delinked from the Tejas programme in September 2008. The major reasons for the failure of the *Kaveri* programme were:

- Technological problems faced on account of development due to the complexities of engine systems
- Lack of availability of raw materials and critical components
- Inadequate manufacturing, infrastructure, and test facilities within the nation
- Lack of availability of skilled or technical manpower in aero engine technology
- Increased scope due to changing requirements during development

As the *Kaveri* engine project was delinked, a replacement GE F404-GE-IN20 engine from GE[4] was selected as a suitable replacement for LCA MK-I and MK-IA, as it was already in use in the Boeing F/A-18, Lockheed Martin F-16 (some variants), and Lockheed F-117 Nighthawk. Such an arrangement helped India progress with the project of LCA MK-I and MK-IA as an immediate replacement for the Mig-21 fleet. However, it did not meet the requirements of India for a more powerful engine or indigenous capability. The long-term plan in India for the next 30 to 40 years is to develop more advanced aircraft like the Tejas Mk-II, Advanced Medium Combat Aircraft (AMCA), and the indigenous Twin Engine Deck Based Fighter (TEDBF) for the Indian Navy (IN) towards replacing the ageing M-2000 and MiG-29s. Obviously, for this plan to be successful, the need for a more powerful and indigenous engine was an inescapable requirement.

The recent visit of PM Modi to the US from June 20 to 24 has resulted in meeting

this critical requirement of the aerospace industry of not only getting the much-needed engine but also its manufacturing in India, along with the opportunity of getting its technology to some extent. The more powerful engine that is now being contracted for manufacturing in India is the F414-GE-INS6, which is an after-burning turbofan engine with a thrust rating of 22,000 pounds (98 KN). Among the aircraft powered by this engine are the Gripen fighter jet and the Boeing Super Hornet. Indian aircraft like the Tejas Mk-II, AMCA, and TEDBF will be powered by it once production on it begins in India.

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Is it a Triumph of India-US Diplomacy?

The significance of the US agreeing to not only manufacture its engines in India but also the likelihood of part transfer of this technology cannot be overstated. While India is a close ally of the US, it has never actually aligned itself with the US-led bloc of nations, such as the UK and Japan. In fact, India has consistently emphasised its own strategic independence and has never capitulated to outside pressure to, for example, sever or even weaken its ties with Russia. Therefore, from the perspective of the USA, such an arrangement of ToT would make a deal with India somewhat risky due to the possibility of leaks, even unintentional ones. This crucial aspect, in a way, explains why, despite GE being prepared to handle the technical aspects of the deal, it has been in limbo for a while. Therefore, it is not without reason that the US Congress's final review and approval, which is a requirement for compliance with the country's Arms Export Control Act, has to be met to complete the deal.

In recent years, the US has repeatedly highlighted the critical role that India plays, not only in furthering the Free and Open Indo-Pacific (FOIP) strategy of the Quad in checking the advancement of China, but also in brokering peace in the ongoing Russia-Ukraine conflict. India, despite the multiple pressures, has made its stand very clear on both issues and has been appreciated by all the nations as well as the United Nations Security Council (UNSC). Keeping these factors in view, in order to advance American interests in the Indo-Pacific region, where the US is engaged in Cold War-style competition with China, the US is attempting to strengthen its strategic ties with India, more out of compulsion than out of choice. Thus, it is evident why the US is willing to hedge its bets on closer ties with India despite its various reservations about the ToT with countries outside of its small, close-knit group of allies. This is being pursued, obviously, to further American foreign policy objectives.

Another Step towards AatmaNirbhar Bharat

Jet engines are a proprietary technology that is the exclusive preserve of a select few

countries, and undoubtedly, jet engines are technically challenging and extremely complex to manufacture. In addition to the difficulties involved in manufacturing jet engines, it is also challenging to design them because they necessitate a complex interplay of aerodynamics, metallurgy, etc. It would still be a big deal, not just for India-US relations but also for India's drive toward self-sufficiency in its defence requirements, even if the new agreement for the joint production of GE-F414 jet engines (see Figure 1) did not reportedly include a 100 per cent technology transfer.[5] India's decision to collaborate with the US to produce advanced jet engines is a significant development that will aid the nation in ending its overt reliance on Russia for jet engines, which is presently a major limitation due to Russian jet engine production is currently constrained by Western sanctions in the wake of the ongoing Russia-Ukraine conflict. The ToT, which is the main constituent of this mega deal, will give India all the necessary authorisations and capabilities to produce certain parts, if not the complete jet engine, domestically. It will also give India room to improve the jet engine for subsequent iterations, further increasing the value of the agreement for *AatmaNirbhar Bharat*. It may be worth noting that the US is now willing to share its critical technology in aviation with India under the iCET. Thus, India would truly move towards the *AatmaNirbharta* sooner than envisioned.

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Figure 1: F414 engine by GE

Source: Snehesh Alex Philip, "India & US close to mega defence deal: Pact for fighter jet engines 1st, ship engines likely next", *The Print*, May 31, 2023, https://theprint.in/defence/india-us-close-to-mega-defence-deal-pact-for-fighter-jet-engines-1st-ship-engines-likely-next/1602974/. Accessed on June 26, 2023.

What's Next for India?

India seems to have won the first major diplomatic megadeal from a superpower that would have otherwise remained firm in preserving its critical technological prowess. The US may eventually share even more proprietary technology with India to advance their shared strategic objectives, including but not limited to the top-secret American nuclear propulsion technology that was recently shared with Australia under the Australia-UK-US (AUKUS) pact, if these new defence ties pan out, which is a possibility.

Notwithstanding these hopes and aspirations, in the present deal, India must firm up its stand, increase its diplomatic pressure, and take advantage of the urgency of the US in deepening its strategic ties with India, to ensure that 100 per cent ToT remains the core area of the deal while other details are negotiated.

An important step has been taken in India and the US's defence cooperation with their agreement to give priority to co-development and co-production of new and existing technologies.

The exclusive meeting of PMs with the CEOs of global tech giants like Google, Microsoft, and Apple has opened the gates for collaboration on emerging technologies like artificial intelligence (AI), quantum computing, and blockchain technology. With most companies pulling out of China, finding a skilled workforce is a key component of the US effort to restart advanced semiconductor manufacturing. India can push itself and leverage its population to fill this gap. It would not only create multiple job opportunities but also bring in technology and investment into India, which would further boost *AatmaNirbharta*. India can also play a pivotal role in the diversification of established supply chains in the area of semiconductors. There are many such areas that can be explored for close cooperation and collaboration with US companies that help India build a stronger economy and strengthen strategic partnerships between the two like-minded nations.

Conclusion

India today is fast emerging as the most valuable strategic partner on the global map for the US and Europe on one side and as a pivot in the Global South as well as in the Indo-Pacific construct on the other. The outcome of years of efforts by India has now started to show results, and this historic Indo-US deal for engine manufacturing in India under the *AatmaNirbhar* concept along with ToT is ample proof of that. An important step has been taken in India and the US's defence cooperation with their agreement to give priority to co-development and co-production of new and existing technologies. The road map finalised during the recent bilateral meeting between the US Secretary of Defense and the Indian Defence Minister will direct US-India defence industrial cooperation policies for the foreseeable future. The historic deal for the manufacturing of the GE-F414 engine in India has paved the way for many more opportunities for future collaboration to build resilient supply chains, identify opportunities for joint technology development and production, and enhance collaboration between defence start-up ecosystems in India. Recognising the growing significance of its status on the global strategic construct, India must now take full advantage of it and strengthen its ties with countries like the US to not only acquire critical technology but also to be in step with the changing dynamics of the rapidly changing geo-political and geo-strategic environment.

Notes:

[1] "FACT SHEET: Republic of India Official State Visit to the United States", The White House, June 22, 2023, https://www.whitehouse.gov/briefing-room/statements-releases/2023/06/22/fact-sheet-republic-of-india-official-state-visit-to-the-united-states/. Accessed on Jun 25, 2023.

[2] Chetan Kumar, "India finally gets indigenous Light Combat Aircraft Tejas", *Times of India,* January 17, 2015, https://timesofindia.indiatimes.com/india/india-finally-gets-indigenous-light-combat-aircraft-tejas/articleshow/45920922.cms. Accessed on Jun 06, 2023.

[3] Anil Chopra, "How military aviation is the greateest beneficiary of Indo-US relations push", *Firstpost,* June 12, 2023, https://www.firstpost.com/opinion/how-military-aviation-is-the-greatest-beneficiary-of-indo-us-relations-push-12728372.html. Accessed on Jun 16, 2023.

[4] Ajay Shukla, "Finally, a deadline for the Tejas Light Combat Aircraft's new engine", *Business Standard,* July 16, 2008, https://www.ajaishukla.com/2008/07/finally-deadline-for-tejas-light-combat.html. Accessed on Jun 06, 2023.

[5] Arnav Jha, "Explained: India-US jet engine deal and its significance for Atmanirbhar Bharat", News Nine, May 31, 2003, https://www.news9live.com/deep-dive/explained-india-us-jet-engine-deal-and-its-significance-2160638. Accessed on Jun 06, 2023.

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