

India and Defence Exports: Prospects of India's Light Combat Aircraft (LCA) Tejas

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Abstract

Over the past seven decades, achieving strategic autonomy through increasing reliance on indigenous weapon systems for armed forces has been a primary and core aim of Indian defence industrialisation. However, with the maturing of India's indigenous defence manufacturing capabilities, India has also begun to look at defence exports. The Indian Government has set an ambitious defence export target of US\$ 5 billion or Rs. 35,000 crores by the year 2024. Serious pursuit of defence exports is critical for the long-term economic viability and continued sustainability of the country's defence industrial base, given its capital-intensive nature and requirement for continued research and development efforts with a long gestation period.

The article underlines the capabilities of the Tejas aircraft as compared to its competitors and flags the strengths of the aircraft which could help it emerge as a major success story for Indian arms exports in the coming years, provided it is able to overcome the drawback of relying on imported jet engines in the medium term.

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Introduction

Almost three decades after the introduction of India's first homemade fighter aircraft, HF-24 Marut, into the Indian Air Force (IAF) in April 1967, the Light Combat Aircraft (LCA) 'Tejas' successfully carried out its maiden flight in Bangalore on 04 January 2001, in the presence of the then Defence Minister Shri George Fernandes.¹ This event was a watershed in India's aerospace history, as the Indian aerospace industry successfully managed to indigenously design, develop, manufacture and successfully flight test a fighter aircraft with many major indigenously designed components and technologies. Fast-forwarding to the year 2022, a total of 123 jets have been ordered by IAF in different operational configurations; namely 20 Tejas aircraft in Initial Operational Configuration (IOC), 20 Tejas aircraft in Final Operational Configuration (FOC) and most importantly 83 Tejas aircraft in Mark 1A configuration.² In 2016, the first squadron of the LCA was officially inducted into the IAF, IOC, and was subsequently deployed at the Sullur air force base in Tamil Nadu.³ In 2020, the second squadron was inducted, with FOC though it is yet to achieve its full squadron strength due to the disruption of the supply chain as a result of the Covid-19 pandemic.⁴

This was a major push for defence indigenisation and the Atmanirbharta program of the Indian Government as it was considered a catalyst for the Indian defence industry, mainly due to two reasons. Firstly, the first procurement of the Tejas fighter aircraft was made under the 'Buy (Indian-Indigenously Designed, Developed, and Manufactured)' category of the Indian Defence Procurement Procedure (DPP).⁵ Secondly, the LCA Tejas project has incrementally been successful in establishing an aerospace ecosystem in the country with the involvement of over 500+ local Indian industries in the designing and manufacture of the aircraft and its various components.⁶ Under the incremental approach, various upgrades like Beyond Visual Range missile capabilities, targeting pod, and Air to Air refuelling capabilities have been made to the baseline model to make the aircraft technologically advanced. Apart from this, the weapon integration and trials are undergoing on Mark 1 variant. In addition, the Defence Research and Development Organisation (DRDO), Aeronautical Development Agency (ADA), and HAL have started work on the fabrication of the

Mark 1A variant which will be technologically more advanced compared to its predecessor Mark 1 as a result of Active Electronically Scanned Array (AESA) radar, Electronic Warfare (EW) suite.⁷

The LCA program is being considered a major milestone for the Indian defence and aerospace industry in terms of achieving self-reliance in aircraft designing, developing, and manufacturing. It has played a pivotal role in creating an ecosystem in the aerospace sector in the country. However, for India to build upon and sustain this capability, it must employ the benefit of economies of scale, and ramping up defence exports is the best way of achieving this. However, achieving self-reliance in defence or critical technologies can't be the sole aim of any defence industry. In order to leverage such a capability for a country's economic, diplomatic, and scientific gains, pushing defence exports is essential. It is this realisation that has led to the government's push for defence exports in a big way.

Importance of Pursuing Defence Exports

The development of indigenous weapon systems, especially high-end and complex systems like the development of fighter aircraft, has opportunity costs. The fighter aircraft development programs require a large upfront capital for setting up production, and testing facilities, in addition to training human resources, establishing a reliable and robust supply chain in addition to certification and validation regimes. A case in point is the development of the fifth-generation F-35 fighter for which the United States (US) has spent around US\$1 to US\$1.5 trillion.⁸ Similarly, the development of Eurofighter Typhoon aircraft also required an investment of around Euros 18 billion.⁹

Many countries across the globe look at defence exports to support, or even partially recover, the huge investments into defence research and development programs. This is necessary for keeping their R&D programs afloat and making continued investments for future projects. From the point of view of arms manufacturers, defence exports are essential to ensure the survival of the defence industrial eco-system, namely the optimum utilisation of the production facilities, trained human resources, and supply chains. In addition, defence exports are also important for

employment generation, fostering continued scientific research into cutting-edge areas and technologies. From a country's perspective, defence exports also allow a country to leverage its defence production capabilities to strengthen its diplomatic position at the international stage.

Defence exports will play a critical role in shaping the future of the Indian defence industrial base. The Government of India has set an export target worth US\$5 billion (INR 35,000 crores) by 2024; the defence aerospace sector can contribute greatly in meeting this ambitious target.¹⁰ Over the years, the Indian defence and aerospace industry has evolved manifold and has gained significant technological capabilities, either through indigenous R&D or by license manufacturing or co-development, which are presently being exported to various countries. India's Minister of State for Defence, Shri Shripad Naik has stated that India currently supplies defence hardware to 84 countries around the world.¹¹ At the moment, the nature of these exports is often in form of components, sub-components, structural assemblies, and, airframe modules. The defence exports from 2015 to 2020 have grown at a cumulative annual growth rate of 35 per cent from 2000 Cr to 9000 Cr.¹² This has resulted in India figuring for the first time in the global defence exporters list published by the Stockholm International Peace Research Institute (SIPRI) in 2020.¹³

To, meet the ambitious target of US\$5 billion by 2024, India needs to promote some big-ticket indigenous defence products such as fighter aircraft, light transport aircraft, trainers, helicopters, missile systems, radars, sonars, naval vessels etc. by identifying the potential markets for them.¹⁴ Presently, Tejas is India's largest indigenous defence aerospace project and it has successfully demonstrated its capabilities to both national and international audiences by active participation in various national and international air shows.¹⁵ The safety of the Tejas aircraft and the robustness of its development process is also attested by the fact that since its first flight in 2001, it has flown over 4,985 test flights without a single crash.¹⁶ Further, the development of the LCA Tejas fighter aircraft has also demonstrated the capabilities of the Indian industries to undertake highly complex and high-end technology-based defence aerospace programs domestically. Therefore, it would be quite a sensible decision for the Indian

Government to promote the LCA Tejas as a frontrunner platform from an export point of view which will help India to break into the exclusive club of defence exporting countries.

Breaking into the Defence Export Club

Given that the global market of LCA is dominated by some well-established players, it will be a challenging task for India's LCA Tejas to emerge as a prime contender. However, several countries reportedly have evinced interest in the Tejas which bodes well. It is important that the government plays to the Tejas's key strengths and gets to know the competition, to be successful in garnering export orders.

The two major competitors for Tejas are the South Korean FA-50 and Chinese JF-17 Thunder. These aircraft have proven credibilities as they have already been exported and have been inducted into their countries' air forces for some time. The following table elaborates how the LCA Tejas compares with its potential rival aircraft the FA-50 and the JF-17:

Table 1 : Comparison of LCA Tejas, JF-17 and T-50/FA-50

	LCA Tejas	JF-17	T-50/FA-50
Program commenced year	1983 (planning began for LCA) 1993 (funding received and project started)	1998	1997
Origin	India	Chinese (with Pakistan collaboration)	South Korea and the United States
Developer/Manufacturer	HAL	CAC - PAC	KAI-Lockheed Martin
First flight	2001	2003	2002/2011
Induction	2016	2007	2005/2013
Generation	4+	4	4
Role	Multi-role	Multi-role	Trainer/multi-role
Weapon integration	Derby Beyond Visual Range (BVR), R-73 and Python-5 air-to-air missiles. Tests going on for indigenous Astra air-to-air missiles. Russian, Israeli, and American weapons are also under trial, testing	Fully operationalized but limited to large Chinese and some Pakistani munitions	Fully operationalized but limited to American munitions, German/Swedish Taurus KEPD 350 ALCM is planned to integrate on FA-50.
Engine	GE-404-IN06 (US)	RD-93 (Russian)	GE-404-102 (US)
Total numbers operational	24 Mark 1 IOC & FOC.	120 Block 1&2.	49 T-50, 9 T-50B, 22 TA-50, 60 FA-50.
Current orders	83 Mark 1A	50 Block 3	NA
Exports	No orders yet	Myanmar, Nigeria	Iraq, Philippines, Thailand, Colombia
Variants	Mark 1, trainer, NP-1 (Naval Carrier version), Mark 1A, Mark 2	Block 1,2,3 A/B, and trainer,	T-50, T-50B, TA-50, FA-50.

Abbreviations: ALCM: Air-Launched Cruise Missile, CAC: Chengdu Aerospace Corporation, HAL: Hindustan Aeronautics Limited, PAC: Pakistan Aeronautical Complex, KAI: Korean Aerospace Industry.

Source: Compiled by the authors from various sources and own database.

Strengths of India's LCA Tejas over its Competitors

Reliability and Cost. If one sees the entire equation from the perspective of a potential buyer, they would like to acquire the cheapest yet tried and tested platform. Given that the FA-50 and the JF-17 have been operating for a longer time, they seem to be ahead of the LCA Tejas. However, the Tejas' performance in international air shows for the past few years and the fact that it has not yet had a single crash despite close to 5,000 test flights is a testament to the aircraft's design and safety. In addition, the Tejas is also quite competitively priced as stated by the Tejas manufacturer, HAL chief, who claims that the LCA Tejas is the cheapest light combat aircraft available in the international.¹⁷ This is primarily due to the high level of indigenisation and modularity and the line-replacement units (LRU) concept introduced by the DRDO during the design and development of the aircraft. However, once Tejas is integrated with an indigenous jet engine, the cost of aircraft would come down further, making it extremely competitive among price conscious customers in the global arms market.

Weapons Package. One of the important variables for comparing fighter aircraft is the weapons package that the aircraft carries. The Tejas LCA is armed with Derby Beyond Visual Range (BVR), R-73 and Python-5 air-to-air missiles with the integration of indigenous Astra A-A missiles planned in near future.¹⁸ In air-to-the-ground mode, it has test fired a few guided munitions and unguided bombs with work underway to enhance its ground-attack capabilities with the development of a lighter variant of the supersonic cruise missile BrahMos NG.¹⁹ Moreover, some media reports indicate that there are plans to integrate the American JDAM, French Hammer and ASRAAM A-A missiles with LCA Tejas.²⁰

On the other hand, most of the JF-17 weapons are of Chinese origin, with few Pakistan-origin smart munitions. The FA-50 too uses American-origin weapons and a few indigenously developed South Korean weapons. Thus, the Tejas is the only aircraft in this category which has a larger spread of weapons package on offer as compared to the JF-17 and FA-50.

Future Upgrades and Customisation. One of the most important factors which could tip the scales in any comparison of the three fighter aircraft in Tejas's favour is the fact that the aircraft is

completely indigenously designed, developed, and manufactured by the Indian developers except for the technical consultations that happened with global vendors during the initial phase of its development. On the contrary, the JF-17 is designed and developed by China and manufactured by Pakistan based on technology transferred by China.²¹ Similarly, the South Korean FA-50 is a collaborative development by American aircraft manufacturer Lockheed Martin and South Korean aircraft manufacturer Korean Aerospace Industries (KAI).²² This is important because it limits South Korea's and Pakistan's right to customise and adapt the aircraft as per the buyer's requirements. Presently, almost 50 per cent of components of the LCA are indigenous and, it will reach 60 per cent in the coming years.²³ This translates into greater reliability of spares to buyers, compared with competitors. Secondly, the LCA is going to be technically far superior to other competitors. As its Mark 1A variant is going to be use Active Electronically Scanned Array (AESA) radar, Electronic Warfare Suite (EW), Beyond Visual Range (BVR) A-A missiles, targeting pod, and A-A refuelling capability for longer endurance (BVR, targeting pod, and A-A refuelling capabilities are available in Mark-1 also). Further, the LCA is fully made of composite material which makes its airframe lighter and more durable.

LCA Tejas's Achilles Heel

Jet Engine. It is, however, interesting to note that none of the light combat aircrafts being compared have indigenously designed or manufactured jet engines. The LCA Tejas and FA-50 both use American General Electric's 404 engine whereas the JF-17 uses the Russia Klimov RD-93 engine.

In the case of aerospace sector, jet engines form the core of the platform, and, therefore without achieving self-sufficiency in jet engine technology, the industry can't achieve its full potential. Presently, only a handful of countries in the world have complete self-sufficiency in designing, developing, and manufacturing state-of-the-art jet engines. These are mainly the US, Britain, France, Russia, and China. The Chinese are the latest entrant into this elite group with development of their indigenous WS-10 jet engine although it is not yet matured as compared to its global counterparts.²⁴ These countries not only cater for their domestic demands for civil and military purposes but also export to the

international market to meet both civil and military requirement. Due to its technical complexity, the development of a jet engine is not just capital intensive but is also a time-consuming and technologically challenging process.

The development of India's indigenous jet engine began in 1982 with DRDO's laboratory, Gas Turbine Research Establishment (GTRE) working on developing the GTX 37(1) jet engine. In 1986, the GTRE's 80 KN Kaveri engine programme was integrated with the LCA programme. The programme received government's approval in 1989, with a target of December 1996. Given the difficult nature of the project, the GTRE was not able to meet the deadlines, resulting in extensions in 2000, 2004 and 2009. To avoid further delays, the Kaveri programme was decoupled from the LCA programme and the American GE 404 IN20 engine was chosen.²⁵ This engine has been used by the ADA during the flight-test phase of the LCA Tejas. So far, 123 LCAs have been ordered by the IAF which will be powered by the GE 404 IN20 engine. In future, the Mark 2 version of the LCA will be powered by a more powerful 98 KN thrust GE 414 engine.²⁶

Continued reliance on foreign suppliers for jet engines will stymie the growth of India's aerospace industry and hamper the chances of LCA Tejas emerging as a good alternative to existing light-category fighter aircrafts in the international arms market. The reliance on foreign suppliers will influence the decision on countries we can export Tejas to and drive up the cost of the aircraft as the engine accounts for about one-third of the cost of the platform. Therefore, India must galvanise its efforts to develop an indigenous jet engine to make its defence aerospace industry cost-effective and autonomous for defence exports.

Conclusion

The Indian LCA Tejas, South Korean T-50 and Chinese JF-17 are the three major platforms vying to grab the Malaysian light combat aircraft deal to supply 18 aircraft to the Malaysian Air Force under the 'Capability 55 Plan'.²⁷ Apart from Malaysia, there are other potential buyers as well among developing countries in Latin America, Africa, and East Asia.²⁸ Thus, the Tejas has the potential to be a big success in India's push to emerge as a major defence and arms exporter. In addition to adding to India's military-diplomatic clout across the world, successful exports of the Tejas LCA will be

useful in partially recovering the R&D costs and ploughing back the proceeds into future upgrades of the aircraft. The exports of LCA will underpin the credibility of India's indigenously developed defence technologies. Apart from strategic and technological advantages, the defence exports will make the Indian defence industry a major contributor to national Gross Domestic Product (GDP) by generating jobs, revenue, and an industrial supply chain. Therefore, in the case of defence exports, the LCA Tejas could be India's trump card in New Delhi's push for being Atmanirbhar in defence manufacturing and emerging as a key defence supplier in the international defence market in the years to come.

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