

Ready to soar: Light Combat Aircraft Tejas inducted into Air Force

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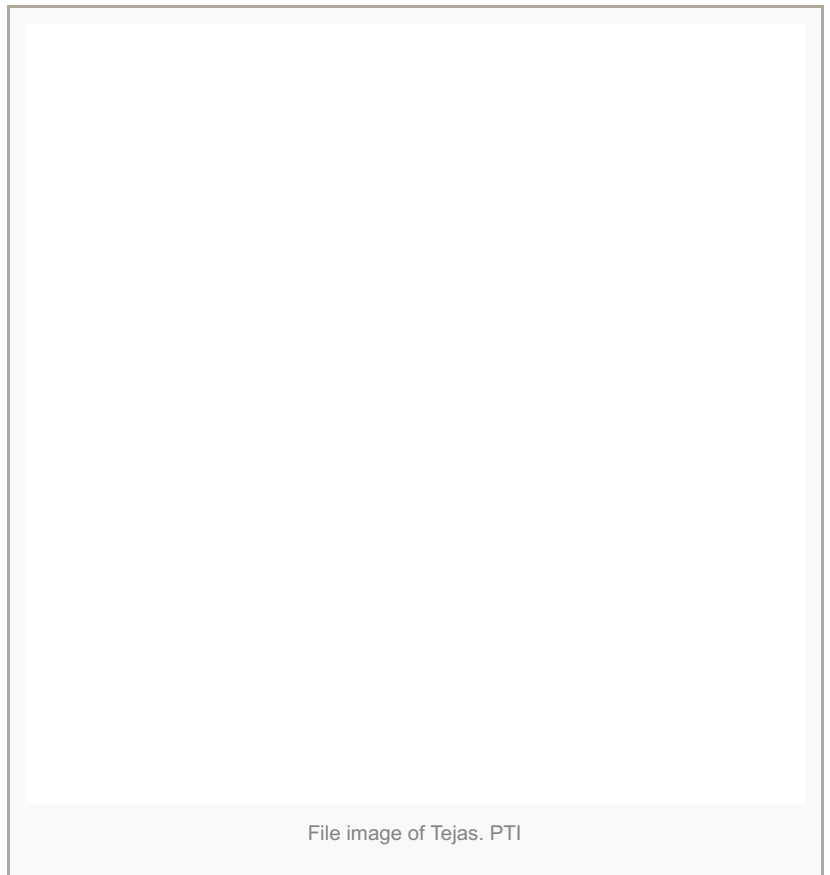
The past week has been a memorable one for Indian defence watchers.

It all began on 25 June with the Indian Air Force creating military history by [successfully flying](#) the Sukhoi-30 MKI (Su-30 MKI) with the *BrahMos* supersonic cruise missile. More good news was in the offing with the Defence Acquisition Council (DAC) chaired by the Defence Minister, [Manohar Parrikar](#) clearing the beleaguered [acquisition](#) of 145 Ultra Light Howitzers and the bulk production of 18 [Dhanush](#) 144mm/45-caliber artillery guns. The howitzers and the artillery guns will add much needed muscle to the India Army's artillery arm which has not seen any new acquisition for the past three decades since the Bofors scandal.

However, more good news is in the offing with the slated induction of the Indian Light Combat Aircraft (LCA) Tejas into the Indian Air Force (IAF) on July 1. The *Tejas* is a fourth-generation; lightweight, multi-role supersonic single-engine aircraft designed and developed by the [Aeronautical Development Agency](#) (ADA) in collaboration with India's largest defence PSU, [Hindustan Aeronautics Limited](#) (HAL). The fact that *Tejas* has not had a single crash in [over 3,100 test flights](#) since its first flight in January 2001 is a rare global achievement and is a testament to the quality of the aircraft design and development.

As former DRDO emeritus scientist Dr V Siddhartha points out, at time of conceptualising the Tejas, digital fly-by-wire system was in its infancy. However, the LCA's designers took up the challenge to design and develop the on-board computer for digital fly-by-wire system. This enabled the LCA's design to be unstable so as to enhance its manoeuvrability. In addition, around 45 percent of the Tejas airframe is made up of composites; which is among the highest for an aircraft of its class in the world. The widespread use of composites makes the aircraft lighter and reduces the number of parts which eases the serviceability and maintenance.

On Friday, the Air Force will [induct](#) two Tejas aircraft manufactured by the HAL under the Series Production (SP1 and SP2) along with a trainer aircraft into the IAF's Number 45 Squadron, the Flying Daggers. The induction is set to take place at the Aircraft Systems Testing Establishment (ASTE) in Bengaluru. This follows HAL's handing over of the first Series Production version of the LCA to the Air Force in January 2015.



The induction of the LCA Tejas into the Air Force will allow the pilots and the crew to become more familiar with the

aircraft, develop a sense of ownership for the aircraft. It will also ensure that the developers receive valuable feedback to improve future versions of the aircraft. The Air Force seems to be following this tack with decision to base LCA squadron in Bengaluru for the first two years before moving the aircraft to the Sullur base in Tamil Nadu. This will allow the IAF to work with the LCA's lead integrator/manufacturer (HAL) and the design team at the Aeronautical Development Agency (ADA) to sort out any initial hiccups.

Both HAL and ADA are based in Bengaluru.

Looking back in time

Upon induction, the Tejas will be the second Indian-designed and manufactured fighter aircraft to be inducted into the Indian Air Force. The first aircraft with that distinction was the HF-24 Marut which was inducted into the Air Force in 1967 and performed very well in the 1971 India-Pakistan War. Designed by the German aeronautical engineer Kurt Tank, the design work on the Marut began in June 1957 with the aircraft taking flight three years later in April 1960. The first operational squadron of the HF-24 was formed in April 1967. However, the country shifted its focus to licensed production of imported aircraft like the MiG-21 and Jaguar, and failed to capitalise on the domestic designing and development capability that had been built up in the HAL as a result of the HF-24 Marut fighter.

[It was in the early 1980s that the Indian Air Force began looking for a light multi-role fighter aircraft](#) to replace the ageing MiGs which were to be phased out in the 1990s. As a response, the ADA was established as a design bureau in 1984. However, the LCA project began in earnest only in June 1993 when it received funding for the first phase of the project to the tune of Rs 1,600 crore. The first flight of the LCA took place on 4 January, 2001. In case, the LCA receives its final operational clearance (FOC) as planned in early 2017, the entire development timeline would be a little over two decades. As Professor Roddam Narasimha, former Director of the National Aerospace Laboratories (NAL) points out, the LCA development timelines could have been shorter. Longer timelines were partly the result of continued modifications in specifications by the Air Force and the economic and technological sanctions imposed by the West following the May 1998 Indian nuclear tests.

The timeline for the [development of the Tejas is comparable with the United States and Russia](#) which possess advanced technological know-how, experience and thriving defence industry ecosystem. In the case of fourth-generation fighter aircraft like the F-15 and MiG-29, the US and Russia respectively took an average of 12 years from the study phase to the final delivery of the aircraft. In case of late entrants with inferior technological capabilities like China, the timelines have been close to 25 years as in the case of the J-10 fighter. Given that when the LCA Tejas project began, the country did not have a domestic aerospace ecosystem to support the project, it is quite commendable that the Tejas had its first flight within a decade and is being inducted into the IAF a little over two decades.

Future challenges

Given that the aero engine accounts for about one-third of the total cost of an aircraft, continued reliance on foreign vendors has obvious financial and strategic implications for the country. A major weakness of the LCA Tejas project and India's aircraft development efforts in general is the continued reliance on foreign vendors for aero engines.

Designing a new aircraft with an unproven engine is a risk that companies are reluctant to undertake. The BAE's Tornado is one of the few examples of a fighter aircraft being flown with a new engine and did not have much success. The LCA Tejas too was designed for flying with a proven engine. Simultaneously, India took the arduous task of designing the Kaveri aero engine which, if successful, would have powered the Tejas. Designing an aero engine is a 'wicked' problem which very few countries have mastered.

However, it is an area where self-reliance in the country is crucial.

Another challenge is ramping up production of the HAL Tejas in order to ensure faster induction into the Air Force in larger numbers. Currently, the HAL has put in place a production line to manufacture eight *Tejas* aircraft per year

and has submitted a proposal to the Ministry of Defence to [double the production capacity](#) to sixteen aircraft per year. With the Tejas likely to achieve Final Operational Clearance (FoC) by mid-2017, it is crucial that the HAL and the defence ministry ensure that the production line bottlenecks are eased out quickly.

Positive spillovers from the LCA Tejas programme

The initial steep learning in the Light Combat Aircraft-Tejas (LCA-Tejas) project has built up national capacity and capability in addition to creating trained manpower in the country. The Naval version of the LCA received formal sanction from the government in March 2003. Less than a decade later, the first flight of the LCA-Navy successfully took place on 27 April, 2012. This was followed up with aircraft [simulating take-off](#) from a carrier at the Shore Based Test Facility (SBTF) at Goa on 20 December, 2014. In May 2016, the LCA-Naval prototype [successfully conducted](#) its first night time operations at the Goa test facility. The direct involvement of the Indian Navy personnel backed by the experience gathered from the development of the LCA-Tejas has resulted in the short development timelines achieved by the LCA-Navy aircraft.



A similar script was enacted in the design of the basic trainer aircraft HTT-40 which successfully completed its [first test flight](#) on 3 May, 2016. The [design of the basic trainer](#) was completed between August 2013 and May 2015 with the prototype being rolled out in February 2016. The fact that India has built domestic design capability was apparent from the fact that HAL's HTT-40 design group was the [youngest ever](#) to be involved in a prototype program. Similarly, the Intermediate Jet Trainer (IJT) *Sitara* achieved first flight in March 2003, within four years of sanctioning of the project in July 1999.

Undoubtedly, the planned induction of the LCA Tejas fighter aircraft into the Indian Air Force on Friday is a red-letter day for the Indian defence research and development establishment. It is crucial that the domestic design and development capability which is achieving maturity should be put to good use in the planned Advanced Multi-Role Combat Aircraft (AMCA). For the Air Force too it is a memorable day as it will get rid of the unflattering tag of being the largest Air Force which does not fly a home-grown fighter aircraft. All said and done, it has been a long journey and the country is waiting to witness the Tejas take to the skies donning the Indian Air Force colours.

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