

Taking Tejas forward

By: Ajai Shukla

The defence ministry must ensure that HAL builds the aircraft at a rate of 12-16 fighters per year to translate it into a real combat asset

Over the preceding decade, under-informed defence writers and commentators have made careers out of bad-mouthing India's Tejas Light Combat Aircraft (LCA). The commentary focused primarily on development delays, criticised the fighter's performance and sneered at the underfunded, under-staffed Aeronautical Development Agency (ADA), a Defence Research & Development Organisation (DRDO) agency responsible for the Tejas programme. Regrettably, the Indian Air Force (IAF) colluded in undermining ADA, passing on tidbits to the media in order to show the Tejas in a poor light, apparently to clear the way for importing expensive aircraft. Thanks to this, most Indians came to regard the Tejas as a byword for delay, incompetence and the untrustworthiness of the DRDO. Most Indians concluded that the purchase of exorbitantly priced foreign aircraft like the French Rafale was unavoidable to keep India safe.

These critics have now done an about-turn after Defence Minister Manohar Parrikar inducted the first two production version Tejas Mark I fighters on Saturday into the IAF's first operational Tejas squadron (45 Squadron). In January, the Tejas made its foreign debut, performing well-received aerobatics displays at the Bahrain International Airshow. Air Chief Marshal Arup Raha, a steady hand at the IAF's tiller, has supported the Tejas and committed to ordering 100 Tejas Mark 1A fighters — similar to the current version, except for four specified improvements. Test pilots involved in the Tejas' flight-testing had always praised its performance and reliability, but now there is also praise from the IAF. Group Captain Madhav Rangachari, the 45 Squadron chief who flew the Tejas on Saturday, reportedly observed afterwards: "I felt like being on top of the world when flying the Tejas fighter. It's an excellent aircraft and a generation ahead of other fighters in the world." That nobody has contradicted Mr Rangachari is a measure of how effusive the media has suddenly become in reporting this story. It needs to be pointed out that the Tejas is not "a generation ahead of other fighters"; it is a contemporary fighter, with several features that match the "best-inclass", while others still require improvement. Even so, the most astounding achievement of the Tejas project is the development of a fourth-generation fighter and a respectable aerospace development, production and testing ecosystem in India for the pittance of ~14,047 crore, just over \$2 billion. This was done in the face of intensified international technology sanctions since the 1998 nuclear tests and, as discussed above, amidst media and IAF hostility.

The operationalisation of the Tejas has not taken "over three decades" as critics dishonestly maintain. They incorrectly cite August 22, 1983 as the start of the Tejas project, when the government allocated ~ 560 crore for "feasibility studies and project definition". In fact, it took another decade, until April 1993, when the defence ministry sanctioned the "Full Scale Engineering Development" (FSED) of the Tejas, and provided funds to build two fighters as "technology demonstrators".

Taking April 1993 as the start of the Tejas development programme, the timeline suddenly looks more respectable. It took just eight years for the Tejas' first flight in 2001; 20 years for initial operational clearance in 2013, and 23 years for final operational clearance and induction into IAF service. The significantly more

capable Tejas Mark IA is expected to be completed by 2018 to meet standards that four agencies – the defence ministry, IAF, ADA, and Hindustan Aeronautics (HAL), which builds the fighter – have hammered out between them, to make the Tejas clearly more capable than current enemy fighters. If that deadline is met, the Tejas will have taken exactly a quarter century in development. That is a creditable record for building a first fighter.

The improved Tejas Mark IA will have an AESA radar, which the DRDO-HAL combine proposes to build in partnership with Israeli company Elbit. It will be capable of air-to-air refuelling to increase range and combat endurance. It will also have a “self-protection jammer” (SPJ) mounted in an external pod to confuse enemy radar. Finally, it will have an improved layout of internal systems to ease maintenance and allow rapid “turnaround time”, ie the quickness with which the Tejas can leave on a fresh mission after returning from an earlier one.

The IAF has already detailed the Tejas’ performance parameters, announcing: “The LCA has a very competitive and contemporary operational envelope. It is capable of operations up to an altitude of 50,000 feet and a maximum speed of 1.6 Mach at [high] altitudes or 730 knots... at low levels. The aircraft [can turn at] +8G to -2.5G (which allows it to U-turn in 350 metres) in operationally clean configuration... or +6G to -2.5G with other external stores.” This respectable performance envelope will be further enhanced when the Tejas IA enters service. It is, therefore, incorrect to suggest, as some commentators and editorial writers have done, that only the import of fighters like the Rafale would give the IAF an operational edge. Directing those billions into the Tejas programme instead would be a more sensible course.

Even as the Tejas Mark IA is being developed, ADA is working on the Tejas Mark II. The key enhancement in that will be the replacement of the current General Electric F-404 engine with the larger, more powerful GE F-414 engine. The technological challenge – which is to re-engineer the Mark I fuselage to fit in the bulkier F-414 – would be offset by the Mark II’s greater power. The re-engineering would also provide the opportunity to replace the current generation of avionics with enhanced, new-generation avionics. Realistically, the Mark II can be expected to enter service by 2023-24, until when HAL can build the 100 Mark IA fighters that the IAF has committed to buying.

Supporting ADA through this programme is essential. That agency is simultaneously working on an Advanced Medium Combat Aircraft (AMCA), which will be a fifth-generation fighter with stealth features, and incorporating an advanced engine that will allow it to supercruise (fly at supersonic speed without lighting the fuel-guzzling afterburner). To enable and empower this project, it is essential to quickly conclude the contract with Russia to co-develop the Fifth Generation Fighter Aircraft (FGFA) that has been mired in negotiations for a decade. The FGFA experience would provide Indian aeronautical engineers the knowhow and experience in working on fifth-generation technologies, which would be translated into the AMCA.

The area of concern, which the defence ministry needs to address on priority, is to ensure that HAL builds the Tejas Mark I and Mark IA at a rate of 12-16 fighters per year. That would allow the IAF to conduct operational planning, obtain buy-in from that service, and translate the Tejas from a debutante into a real combat asset.

Welcome Tejas

The indigenous aircraft still has a long way to go

Last week the IAF formally inducted the indigenously developed Tejas light combat aircraft (LCA). This ‘event’ was hailed by many as a major milestone and technological leap in India’s military aviation history. So far only two of these aircraft have been inducted into the IAF’s first Tejas squadron which will be stationed in Bengaluru for at least two years under the ‘care’ of Hindustan Aeronautics Limited before it is relocated to an operational air base. The squadron is expected to achieve its full complement of 16 fighter versions and two to four more trainer versions of these aircraft during this two-year period.

Is there much to celebrate? Fighter aircraft are highly complex and manoeuvrable extreme machines which operate in a high stress aviation environment that comprises sharp turns, high acceleration and the danger of gravity-induced loss of consciousness for pilots who are required to operate sophisticated on board avionics and weapon systems. On the face of it, India has joined a select group of countries that make fighter aircraft, yet that it is still early days for the Tejas which is not yet a ‘finished’ fighter. The much delayed LCA, conceived 33 years ago, was meant to replace the antiquated Soviet-origin MiG-21s which the IAF continues to operate because of inordinate delays and slippages in the development of the Tejas. Unfortunately, the Tejas Mk-I is a heavily compromised aircraft with significant shortfalls in operational performance and capability due to over 50 concessions and waivers. The present Mk-I version is yet to receive its final operational clearance and continues to be import-dependent for 65 per cent of its components ranging from radars and armaments to its engine.

The Tejas thus still has a long way to go provided there are no further delays in the development of the subsequent two versions — Mk-IA and Mk-II — in which the shortcomings are expected to be addressed. The next challenge will be to develop Tejas into a fully mature and dependable fighter. The IAF’s fighter strength is fast depleting, and this is all the more reason that we move beyond symbolism.

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Large numbers matter

By: Anantha Krishnan M

The critics of home-grown Light Combat Aircraft (LCA) Tejas might be struggling to chart a new flight path for their future assault. With the euphoria over the induction of the first Tejas Squadron continuing, some of the fieriest critics have already switched sides. After all, success breeds success.

After waiting in the wing for over 15 years since its first flight, the Indian Air Force (IAF) finally inducted two Tejas fighters on July 1, signalling the beginning of a new era in country's military aviation. The No. 45 Squadron of the IAF (Flying Daggers) would be based in Bengaluru for the next two years, fine-tuning all aspects of flying, ground-handling and repair of a new fighter plane.

Having chased Tejas for nearly a quarter of century as a defence writer, it was a great moment of pride to see Group Captain Rangachari taking the bird for the first official sortie in IAF colours. The long wait has finally ended and Tejas has flown into IAF hangars. The onus now completely shifts to Hindustan Aeronautics Ltd (HAL) to produce it in large numbers and Aeronautical Development Agency (ADA) to fasten the Final Operational Clearance (FOC) process. Those who saw ADA-HAL relationship from close quarters would agree that both should now look at Tejas through the eyes of IAF. This shift in focus and thought process would propel the project ahead.

For the project from here on, it's all about numbers. As per the current plan, the next 18 production variants should be delivered to IAF by 2018 to form the full squadron. Many firmly believe that unless HAL gets more firm orders, the private sector wouldn't join hands. The HAL says that by ramping up its infrastructure, production rate would increase and they would deliver 120 aircraft by 2025.

But IAF's worries are far from over. They do not want to brand Tejas Squadron as a two-plane unit. They are keen to have the follow-on planes at the earliest. They want two more planes by Air Force Day celebrations at Hindon this year. HAL says they have brought down the equipping cycle from 32 months to eight months, a pointer to its commitment to the national programme.

Next six months are crucial for ADA as they prepare Tejas for a series of missions to fulfill the full operational capability (FOC) parameters. The pending milestones include: air-to-air refueling capability; integration of GSH 23 mm gun, a tandem pylon to enhance bomb carriage capability; integration of BVRAAM (Beyond Visual Range Air to Air Missile) and finally expansion of aircraft envelope for higher Angles of Attack-cum-improved manoeuvring.

While the work is in progress at different stages to undertake these missions, it's not sure whether HAL-ADA-NFTC (National Flight Test Centre) combine would complete these in six months. If not, the FOC would get extended by another three months. However, while the FOC may be in the early part of 2017, the structural build standard of the aircraft would be frozen by end of this year. This is critical for HAL to plan the build of the second 20 aircraft.

The FOC-variants would join IAF after the first 20 is delivered in the Initial Operational Clearance format. But IAF would now test the ability of HAL-ADA to quickly incorporate their feedback on to new Tejas production variants. Before the Squadron moves to its permanent base in Sullur by 2018, the IAF ground crew would work in close liaison with HAL fine-tuning their skills based on pilot feedback. Product support becomes a key factor for Tejas' Squadron operations now.

So what have we learnt from the Tejas story so far? The biggest one could be the self belief in developing a whole range of enabling technologies for a fighter. We developed technologies that were denied. Lessons from Sanctions came as a big boost to scientists and engineers, as they challenged themselves. It opened new window of opportunities.

Locally developed technologies

The fly-by-wire flight Control Laws (CLAW) developed jointly by ADA and National Aerospace Laboratories (NAL) for Tejas is an ideal example to cite. The Digital Flight Control Computer (DFCC) from Aeronautical Development Establishment (ADE) is another critical system we developed. Hardware and software of the complete avionics suite of Tejas was locally developed. Taking the challenges head on was the key.

There has been earlier a lament that the user changed the requirements thus delaying the programme. However, as brought out by the current head of ADA, the aircraft is 'future ready' and changes in weapons and sensors would be incorporated with minimal effort.

This is considered a big plus in the aircraft and systems capability. The IAF must now aggressively brand Tejas at global platforms, like other Air Forces do. Similar to what India did at Bahrain this year, Tejas and its capabilities should be showcased to the world more often, signalling our military might.

The private sector is waiting with eagerness to join the Tejas party, hoping to get a larger share of fighter production. The Make in India mantra could spring the desired magic if the government comes out with an out-of-the-box idea to enable HAL to deliver Tejas at faster rate.

The HAL will need industry best practices and the world's best programme management to achieve this. Kota Harinarayana, revered as the father of Tejas project, wants a strong team closely working with the Tejas Squadron.

Moving ahead, unity is the key for the Tejas project. Jointness is a word often used among Services these days. Time HAL-ADA-IAF and other stakeholders gave 'jointness' a new meaning. Tejas is late. But it is light and lethal. And, it has arrived! (The writer is a Bengaluru-based independent aerospace journalist and author)



Tejas, MTCR to BrahMos on Su-30 MKI & Varunastra for Indian Navy: Big developments in India's defence



Tejas induction, MTCR entry, test-flight of Sukhoi 30-MKI, successful test firing of new surface-to-air missile for IAF, and finally, the handing over of Varunastra, India's own lethal torpedo for the Indian Navy - India's defence space under Defence Minister Manohar Parrikar has seen a lot of boosts in the last month. Additionally, the Narendra Modi government has also tweaked 100% FDI in defence rules, in an attempt to invite more foreign investment into the sector and bolster the private defence industry. We take a look at six developments in June, that will prove to be a big shot in the arm for India's forces and defence preparedness:



Tejas, the indigenous Light Combat Aircraft (LCA), has finally been inducted into the Indian Air Force. IAF has raised the first squadron of Tejas with the induction of two aircraft into the force and plans to put the LCA in combat role by 2017. Tejas is said to be the world's smallest lightweight, multi-role single engine tactical fighter aircraft. It is a single engine, light weight, highly agile, multi-role supersonic fighter. It has been designed and developed by DRDO, HAL and ADA. (Photo by ADA)



Giving a boost to the 'Make in India' drive in the defence sector, India recently test-fired a new surface-to-air missile that it has jointly developed with Israel. The missile which is said to be a variant of the Barak 8, has been developed for the Indian Air Force (IAF). Such type of medium range surface-to-air missiles (SR-SAM), having striking ranges from 50 to 70 km, can fill the gap of existing missiles that India has in its armory at present.



Brahmos, the world's "most formidable" supersonic cruise missile system, has been successfully integrated and test-flown with the Indian Air Force's (IAF) Su-30MKI frontline strike fighter! With this successful flight, the BrahMos air version programme now inches closer towards actual test firing, when a 2.5-ton BrahMos air-to-ground missile will be fired from the Sukhoi-30 in the coming months. The flight trial was keenly observed by several other nations in the world in possession of the Su-30 strike fighter who are looking towards acquiring a lethal weapon system for the Russian-made warplanes. (Image: MoD)



India has finally become a part of the coveted MTCR (Missile Technology Control Regime), a move that will greatly enhance its potential to export missiles, giving a boost to the indigenous defence sector. Not only that, India will also get access to high-end missile technology from other countries. MEA sources told FE Online, "India's MTCR membership is expected to facilitate high technology tie ups with Indian industry and ease access to high tech items for space and defence programmes." (File Photo of BrahMos)



Promotion of the shipbuilding and ship repair industry in India holds importance as it has "the same impact as the infrastructure sector due to higher multiplier effect on investment and turnover (11.6 and 4.2) and high employment potential due to multiplier effect of 6.4, the government has earlier said. (DRDO Photo)



HAL's HTT-40 is an indigenous basic trainer aircraft, whose inaugural flight was witnessed by Manohar Parrikar recently. The trainer aircraft's flight comes as a shot in the arm for Narendra Modi government's 'Make in India' initiative. The aircraft is aimed at being used for the first stage training for all flying cadets of the three services. With advanced features like zero-zero ejection seats and multi-function displays, HTT-40 can also be adapted as a light attack aircraft. (Photo by HAL)