LCA closer to IOC

Tejas LSP-3 in maiden flight

Days after the Standing Committee on Defence was briefed at Parliament House in New Delhi on the 'Light Combat Aircraft Development Programme', with the government sanctioning an extension of the fighter's 'full-scale engineering development' (FSED) till 31 December 2018 (see box), a significant event took place at Bangalore. The 52-minute flight of the Tejas LCA limited series production 3 aircraft (LSP-3) on 23 April 2010 may have been nearly a year late than originally planned but marked a watershed in this protracted but steady programme.

The Tejas LSP-3 (KH-2013) is the ninth test vehicle to join the flight line for development flight trials of the Light Combat Aircraft proceeding towards achieving initial operational clearance (IOC) for induction in the IAF by end 2010. The virtual 'copy book' maiden test flight of LSP-3 was of immense satisfaction to the designers, engineers and test team of the Aeronautical Development Agency (ADA) and its National Flight Test Centre (NFTC), apart from supporters in New Delhi.

This was the 1350th flight of the LCA (achieved collectively by TD-1, TD-2, PV-1, PV-2, PV-3, PV-5, LSP-1, LSP-2) but from LSP-3 onwards, in addition to the main Digital Flight Control Computer (DFCC), there are four air data computers (ADC) for air data computations. As officially stated, "the quadruple ADCs, indigenously designed and developed by the Aeronautical Development Establishment (ADE) have taken care of the inevitable obsolescence of Air Data Transducers (ADT) which were imported and also off loaded some of the computations from DFCC in order to incorporate Autopilot functionality. These Air Data Computers are distributed asynchronous computers with respect to DFCC and hence taking care of all the failure modes of this computer was quite a challenge. Coupled with this was the additional challenge of realising this flight critical hardware by Bharat Electronics Limited (BEL) Bangalore in coordination with the design, manufacturing and certification agencies (CEMILAC and DGAQA)."

The most important aspect of LSP-3 is that this aircraft incorporates the required sensors and weapon systems required to achieve Initial Operational Clearance (IOC) standard. The key sensors integrated on LSP-3 include the Multimode Radar (MMR), Radar Warning Receiver (RWR), VHF Omni Range and Instrument Landing System (VOR/ILS) and Tactical Navigation System (TACAN). The primary sensor, and mission critical system of the Tejas is its Multimode Radar, jointly designed and developed by ADA, HAL, LRDE, ECIL with ELTA of Israel and is reportedly based on the EL/M-2032 which is an advanced pulse Doppler, multimode Fire Control Radar intended for multi-role fighter aircraft, with origins in the Lavi project.

This radar is designed to work in air-to-air, air-to-ground and air-to-sea modes and has high resolution ground mapping with many other features. The RWR is designed and developed by DARE and BEL while the VOR/ILS and TACAN

Wg Cdr George Thomas after landing the LSP-3.

systems are designed and developed by SLRDC, HAL at Hyderabad. With these systems integrated and flown, the Tejas "is very close to final production standard aircraft as planned to be inducted into the Indian Air Force," according to ADA.

The LSP-3 maiden flight was made by Wg Cdr George Thomas (formerly CO No. 20 Squadron who had led the IAF team at 'Red Flag' in Nellis, USA and is now with the National Flight Test Centre at ADA). As per standard procedure the first flight was shepherded by a chase aircraft (Tejas Trainer PV-5) flown by Gp Capt RR Tyagi, the Chief Test Pilot and Wg Cdr (Retd) PK Raveendran SC, the Group Director (Flight Test). The test flight was conducted from the Telemetry station by the Test Director, Wg Cdr S Toffeen, under the supervision of Air Cmde Rohit Varma VM, the Project Director (Flight Test).

Tejas PV-5 two-seater which acted as the 'chase aircraft'.

Tejas LCA Project Costs

The Committee during the course of examination of Demands for Grants of the previous year had noted that the LCA project was sanctioned in 1983 with the original cost of Rs. 560 crore. The first phase of the project was completed on 31 March 2004 with the cost of Rs 2188 crore. The sanctioned cost of the second phase was Rs 3301.87 crore and projected date of completion was 31 December 2008. The Ministry further informed that in November 2009, sanction was accorded for continuing full scale engineering development of the LCA till 31 December 2018 with an additional cost of Rs 5302.98 crore.

Report Card (as documented by MoD)

"Flight Test Phase on LCA Tejas initiated on 4 January 2001. Overall objectives of Tejas FSED Phase I have been achieved in March 2004 with completion of 202 flight tests on Tejas (TD-1, TD-2 & PV-1) demonstrating critical technologies identified during PDP. As on 15 March 2010, total of 1324 flight tests (776 hrs: 59 mins flight duration) have been completed utilising 8 Tejas aircraft.

Handling quality is adjudged as "very good" by 15 test pilots of IAF and Indian Navy. Maiden flight of the first two-seater (trainer) version Prototype Vehicle 5 (PV-5) took place on 26 November 2009. Presently, LCA Phase 2 activities leading to Initial Operational Clearance (IOC) are in progress. GE F404 IN20 engine and Martin Baker Mk.16G ejection seat installed and are functional on the Tejas. External stores (800 Itr & 1200 Itr drop tank) identified for IOC, integrated and flight tested.

Air-to-ground weapons including practice bombs and 1000lb bombs integrated and dropped successfully. Air-to-air close combat missile (R-73E) released from Tejas. Sea level trials completed at Arrakonam and Goa. Hot weather trials (Phase 1) completed at Nagpur. Cold weather flight trials (Phase 1) carried out successfully at Leh. Night flying trials (Phase 1) completed. Crosswind take off and landing carried out successfully. Initial Operational Clearance (IOC) is scheduled to be completed by December 2010.

Searching for a new engine

With regard to the LCA powerplant, the Committee, during the course of examination of Demands for Grants of the previous years, had been informed that the Tejas was running into 'serious problems' and the option was to either to import an engine (either the GE F414 or EJ 200) or persist with the GTRE Kaveri. The Committee was later informed that the final position to import a suitable engine in place of Kaveri engine had been taken, Requests for Proposal were floated and responses received. Technical evaluation of the offers received was 'under progress'.

Tejas (Light Combat Aircraft) Full Scale Engineering Development (FSED) Programme

FSED Phase 1

Sanctioned cost	Rs 2188 Crore (inclusive of rough estimate of Rs. 560)
Projected date of completion:	30 June 1998
Total expenditure:	Rs 2188 Crore
Actual date of completion:	31 March 2004

FSED Phase 2

Sanctioned cost	Rs 3301.78 Crore
Projected date of completion	31 December 2008
Revised PDC	31 December 2012 (with additional fund of Rs 2475.78 Crore)

In November 2009, sanction has been accorded for continuing Full Scale Engineering Development of the LCA till 31 December 2018 with an estimated additional cost of Rs 5302.98 crore.