

**OFFICE OF THE  
COMPTROLLER & AUDITOR GENERAL OF INDIA**

**NEW DELHI**  
08<sup>th</sup> May, 2015

**CAG Audit Report on Design, Development,  
Manufacture and Induction of Light Combat Aircraft  
Presented**

The Audit Report of the Comptroller and Auditor General of India on Defence Services (Air Force) on Design, Development, Manufacture and Induction of Light Combat Aircraft No. 17 of 2015 was laid in the Parliament today and hence it has become a public document.

Indian Air Force (IAF) was operating MIG-21 series of aircraft manufactured during 1966 to 1987. IAF proposed (early 1980s) for a new aircraft in place of MIG-21 fleet on its phasing out in the 1990s. Against this backdrop the indigenous design and development of Light Combat Aircraft (LCA) was sanctioned (1983) at a cost of Rs. 560 crore which was enhanced from time to time up to Rs. 10397.11 crore. Government of India constituted (June 1984) Aeronautical Development Agency (ADA) as a dedicated institution for the management of LCA project. IAF had issued Air Staff Requirement (ASR) in Oct 1985 envisaging a light weight multi-mission fighter aircraft, having contemporary air combat and offensive air support capabilities with excellent maneuverability for close air combat at low and medium altitudes with a projected requirement of 220 Light Combat Aircraft (200 Fighters + 20 Trainers) to be inducted by 1994.

LCA has only achieved Initial Operational Clearance (December 2013) against earlier scheduled date of December 2005 and the Full Operational Clearance(FOC), which was scheduled to be completed by December 2008, is now scheduled to be achieved by December 2015 (as projected by ADA). However, LCA Mark-I does not meet the ASR. The deficiencies are now expected to be met in LCA Mark II by December 2018.

This review points out the need for a more efficient management of planning and execution of aircraft development programmes, closer interaction and coordinated efforts among all the stake holders involved, ensuring effective indigenisation efforts, creation of adequate manufacturing facilities in a timely manner and supply of aircraft to IAF in line with their induction planning.

**Key Audit findings:**

- ADA's decision to advance building of two prototypes from Full Scale Engineering Development (FSED) Phase-II to FSED Phase-I so as to utilise its savings on the grounds of accelerating the development process of LCA, failed to yield the desired results as the preponed prototypes were deficient of critical onboard systems (Multi-Mode Radar, Self-

Protection Jammer, Radar Warning Receiver) and led to ADA using the Limited Series Production(LSP) aircraft (meant for IAF use) towards flight testing/evaluation of these critical on board systems. This was in contravention of the Cabinet approval (November 2001) for Phased development of the prototypes in FSED Phase-II after Technical Demonstrators had been built and flight tested for 210 hours.

**(Para 2.1)**

- LCA Mark-I, which achieved IOC (December 2013) has significant shortfalls (20 permanent waivers/33 temporary concessions) in meeting the ASR, leading to reduced operational capabilities and reduced survivability and consequently its operational employability. Shortcomings in LCA Mark-I (increased weight, reduced internal fuel capacity, non-compliance of fuel system protection, pilot protection from front, reduced speed) are expected to be overcome by development of LCA Mark-II. LCA Mark-II, an aircraft with lower weight and a higher thrust engine to be ready by the time LCA Mark I with IOC and FOC configuration is produced by HAL, with an aim to productionise LCA Mark II by 2016, is scheduled for completion by December 2018.

**(Para 2.3)**

- IAF would be constrained to induct fighter LCA without availability of trainer LCA, which was yet (January 2015) to achieve IOC/FOC thereby adversely impacting pilot training. In the interim, IAF was using an upgraded Full Mission Simulator (FMS) at ADE for pilot training, pending supply of a FMS by HAL at LCA operating base.

**(Para 2.3.1)**

- Long gestation time led to change of weapon systems on LCA necessitating acquisition of new weapon systems. This led to design changes on the aircraft, coupled with delay in integrating R-73E missile with Multi-Mode Radar/Helmet Mounted Display and Sight. Delayed identification (December 2009) of Beyond Visual Range Missiles also contributed to the delays in achieving IOC/FOC by LCA.

**(Paras 2.3.2, 2.3.3)**

- LCA Mark-I is deficient in Electronic Warfare capabilities as specified by IAF, as the Self Protection Jammer could not be fitted on the aircraft due to space constraints and the Radar Warning Receiver/Counter Measure Dispensing System fitted on the aircraft are having performance concerns, which were yet to be overcome (January 2015).

**(Para 2.3.4)**

- LCA programme is being monitored by General Body, Governing Body, involving the representation of MoD, Ministry of Finance at the highest level, various committees at ADA/HAL, Empowered Committee chaired by Chief of Air Staff. Need for a Liaison Group between Air HQ and ADA to ensure closer interaction between the design team and the user had been recommended by the LCA Project Definition Phase (PDP) Review Committee as

early as in 1989. In spite of this, delays in completion of work packages affected the LCA programme schedules, which indicates that coordination of efforts at various levels and monitoring of the programme by all the agencies involved, has not been as envisaged. Moreover, no liaison group was formed and active user (Air HQ) participation in the LCA Programme started only after November 2006, which also impacted the LCA development.

**(Paras 2.4, 2.5)**

- Government of India had emphasized (June 1993) on increasing the indigenous content of LCA while sanctioning FSED in phased manner, but ADA did not make any roadmap for indigenization during LCA development. As a result, indigenous content of LCA estimated by ADA as 70 *per cent* actually worked out to about 35 *per cent* (January 2015).

**(Para 3.1)**

- LCA systems such as Kaveri engine, Multi-Mode Radar, Radome, Multi-Functional Display System and Flight Control System Actuators taken up for indigenous development could not be developed successfully, resulting in LCA's continued dependency on import of these systems. Development of Jet Fuel Starter, though achieved indigenously, had performance issues which were yet to be resolved (January 2015).

**(Para 3.1.1)**

- Design, development and productionisation of LCA through concurrent engineering did not compress the development time as envisaged in the FSED Phase-II sanction (November 2001). Prototype version (PV) and Limited Series Production (LSP) of LCA built by HAL had low serviceability due to delay in snags analysis, slow recovery of aircraft from rectification, shortage of critical LRUs at flight hangar, aircraft being used as test rigs, large number of unproductive sorties etc which impacted availability of aircraft for flight testing and contributed to delays in development of LCA. Even LSP-8 aircraft fell short of the ASR in terms of weight and speed, for which permanent waivers had to be granted by Air HQ when LCA achieved IOC (December 2013).

**(Paras 4.2.2, 4.5.1)**

- The manufacturing facilities created at HAL presently cater for production of only four aircraft *per annum* against the envisaged requirement of eight aircraft *per annum*, which would further impair induction of LCA/formation of IAF squadrons.

**(Para 4.3)**

- Repair and Overhaul (ROH) facility for LCA, as specified in the ASR has not been created fully at HAL. Out of the 344 Line Replaceable Units (LRUs) of LCA, ROH facilities in respect of only 185 LRUs were available (January 2015).

**(Para 4.4)**

- Awarding of the 20 IOC contract by MoD to HAL in 2006 when LCA design was nowhere near finalization, was premature, as only Technology Demonstrators /Prototypes were flying and LSPs were yet to be built. Awarding of contract (December 2010) for supply of 20 FOC configuration aircraft by MoD to HAL even before commencement of supply of IOC configuration aircraft, freezing of designs and achieving of FOC was also premature. Further, HAL had advances of Rs. 1509.22 crore since 2010 without utilising it against the contract (January 2015).

**(Paras 4.6.1, 4.6.2)**

- Due to delay in manufacture and supply of LCA, IAF had to undertake alternate temporary measures such as upgradation of MIG BIS, MiG-29, Jaguar, and Mirage aircraft at a cost of Rs. 20,037 crore and revise (January 2013) the phasing out of MiG-21, to overcome depleting squadrons with obsolete. Nevertheless, early induction of LCA in IAF is critical to overcome the drawdown of squadrons.

**(Para 4.7)**

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**BSC/RSJ**