

Knowledge Centre-Defence Audit

**PA on design, development, manufacture and Induction of Light
combat Aircraft**

Group VI

**VINAY KUMAR TIWARI
RAHUL VERMA
ABHAY KUMAR
VEDPRAKASH
DIGIL M D**

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Background of Light Combat Aircraft Project

- ▶ Necessity for adopting the Design, Development, Manufacture and Induction of Light Combat Aircraft.
 - I. For replacing the aging MIG-21 Fleet.
 - II. Indigenous design, development and production to achieve self reliance in Critical systems.
- ▶ Government of India sanction (1983) for design, development and manufacture of Light Combat Aircraft.
- ▶ Inception of Aeronautical Development Agency for the management of LCA Project.
- ▶ Air Staff Requirement (ASR) (1985) comprising physical parameters of LCA
- ▶ Cabinet committee on Political Affairs approval (Feb 1991) for execution of LCA Project.

Audit Design Matrix

Performance Audit on 'Design, Development, Manufacture and Induction of Light Combat Aircraft'

S.No.	Audit Objective	Audit Question	Audit Criteria	Evidence	Data Collection
1	To examine the execution of LCA Project	1.1 Whether the milestones of FSED Phase 1 were achieved or not?	Ministry of Defence's (MoD) sanction letters and approvals of Cabinet Committee on Security	Government of India Sanction (June 1993)	
		1.2 Whether the ADA decision to advance the manufacturing of Prototype Versions from FSED Phase 2 to FSED Phase 1 yield the desired result or not?	Minutes of meetings of General body, Governing Body of ADA, Empowered Committee, Programme Management Team of IAF, HAL Board of Directors	ADA, General Body approval (November 1995)	
		1.3 Whether the Limited Series Production Aircrafts were built and supplied in time and utilised for its intended purpose?	Memorandums of Understanding, Consultancy contracts, supply orders entered into by ADA and HAL and MoD contracts with HAL for supply of LCA	MoU dated (June 2002) between ADA and HAL, MoD commitment dated October 2001.	
2	To examine whether indigenous capability was developed through LCA programme.	2.1 Whether there is any road map for indigenous plan as such or not?	Minutes of meetings of General body, Governing Body of ADA, Empowered Committee, Programme Management Team of IAF, HAL Board of Directors etc.	Empowered committee meeting report (June 2013)	
		2.2 Whether LRDE/HAL was able to develop MMR successfully or not?	Memorandums of Understanding, Consultancy contracts, supply orders entered into by ADA and HAL/LRDE.	MoU dated (June 1991) between ADA and HAL/LRDE.	
		2.3 What all were the reasons for delay in testing of MMR?	Aircraft trial reports, reports of various committees and certifying agencies.	Release to Service Document (RSD) of IOC of LCA	

Organisational structure for implementation of LCA



Objective : To examine the execution of LCA Project

- ▶ The Light Combat Aircraft was to be executed in two Full Scale Engineering Development (FSED) phases
- ▶ FSED Phase-1 involved building and limited flight testing of two LCA Technology Demonstrator (TD1 and TD2) aircraft to demonstrate confidence levels in critical technologies through 210 hours of test flying and parallel development of other technologies and proving them on ground rigs/flying test beds.
- ▶ FSED Phase -1 was sanctioned (June 1993) at a cost of Rs.2188 crore (including Foreign exchange Rs.873 crore) and was to be completed by June 1998.

Audit Findings

FSED Phase-1 delayed by Six years and treated as completed in March 2004 against scheduled completion of June 1998 without completely meeting the intended objective of phased development.

Milestones under FSED Phase - 1

SI No	Milestone	Scheduled date of completion	Actual date of completion
1	Roll out of first aircraft (TD1)	June 1995	November 1995
1	First flight TD1	December 1996	January 2001
2	First flight TD2	September 1997	June 2002
4	First Flight of PV1	December 1999	November 2003
5	First flight of PV2	June 1998	Shifted to FSED Phase 2
3	Completion of 210 hours of flying (TD1 and TD2)	June 1998	124 hours completed by 31 st March 2004

FSED Phase - 2

Targets, Sanction, Milestones Achieved & findings

- ▶ *FSED Phase -2* involved the manufacturing of five Prototype Versions (PV1-PV5), integration of technologies developed in parallel in phase - 1, integration of Kaveri engine, flight testing and weapon integration to achieve Initial Operation Clearance (IOC) and Final Operational Clearance (FOC).
- ▶ FSED Phase -2 and proposal for concurrent production of eight Limited Series Production (LSPs) Aircrafts for the use of Indian Airforce only was sanctioned in November 2001 at a total cost of Rs 3301.78 crore (Foreign exchange 1526.49 crore) with probable date of completion by end December 2008

Findings

- ▶ Delayed completion of Milestones Under FSED Phase - 2.
- ▶ LSPs built for IAF use were utilized by ADA towards flight testing/evaluation purposes.

Milestones under FSED Phase -2

Sl. No.	Milestone	Original date of completion	Revised date of completion	Actually achieved date
1	PV2-first flight(Carried forward from Phase-1)	December 2002	-	December 2005
2	PV3-First flight	July 2003	-	December 2006
3	PV4-First flight	December 2013	Jan-Feb 2010	November 2014
4	PV5-First flight(Trainer)	October 2004	August 2009	November 2009
5	Achievement of IOC	December 2005	December 2006	December 2013
6	Manufacture of 8 LSP standard LCA by HAL and delivery to IAF	May 2006- May 2008	May 2006- May 2008	HAL manufactured 7 LSP aircraft during April 2007 to March 2013
7	Achievement of FOC	December 2008	December 2012	Not achieved

OBJECTIVE 2: TO ASSESS WHETHER INDIGENOUS CAPABILITY WAS DEVELOPED THROUGH LCA PROGRAMME.

- ▶ The GoI had emphasized (June 1993) on increasing the indigenous content of LCA , but ADA did not make any roadmap for indigenization during LCA development.
- ▶ ADA targeted developing critical components and advanced systems such as Kaveri Engine ,Multi Mode Radar(MMR), Radome, Multi Functional Display System (MFDS), Flight Control System Actuators(FCSA), Jet Fuel Starters(JFS).
- ▶ Development of Engine for LCA.(KAVERI Project)
GTRE's failure to develop Kaveri engine as per the requirements has made the LCA perennially dependent on imported aero engines throughout its service life.

► Development of Radome.

Failure of Radome development impacted MMR testing with cascading effect on accomplishment of FOC.

► Development of Multi Mode Radar(MMR).

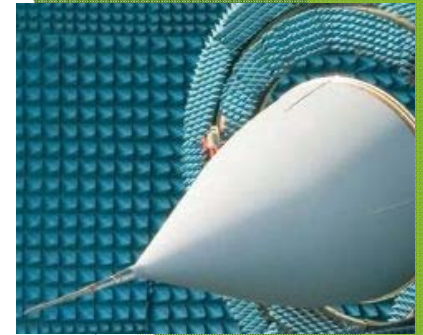
MMR developed jointly by LRDE/HAL had performance shortfalls and ADA had to go in for co-development of MMR with foreign firm.

► Estimated by ADA...? Achieved by ADA...?

Indigenous content of LCA estimated by ADA as **70%** actually amounted to only about **35%** and hence the aircraft was dependent on foreign sources for critical components.

► LCA Induction Plan.

- i. IAF had to resort to alternate measures to maintain the force level.
- ii. LCA squadron formation got delayed causing adverse operational impact on IAF.



CONCLUSION

- ▶ LCA is comparable to many contemporary aircraft in the world.
- ▶ Considerable time taken in the development of LCA
- ▶ LCA Mark-1 despite achieving the IOC, does not meet the ASR.
- ▶ ADA claimed 70 percent indigenisation

RECOMMENDATIONS

- ▶ Realistic timeline should be projected by MoD
- ▶ ADA should consult the user(IAF) and obtain prior approval of sanctioning authority
- ▶ Agencies viz. DRDO, ADA and HAL should undertake the projects strictly in conformity with the specifications projected by the IAF.
- ▶ Indigenization efforts
- ▶ MoD should award contract to production agency at an appropriate stage of development of a system/equipment.