CHAPTER V

MILITARY R&D PROJECTS: PROGRESS AND RESULTANT MILITARY BALANCE IN THE REGION

The services that ‘relied’ on the successful completion of the Arjun and Light Combat Aircraft (LCA) projects “to replace their old equipment were forced either to seek alternatives or continue to use their existing equipment”\(^1\). Meanwhile, countries in South east Asia, West Asia, Pakistan and China have been strengthening their armed forces through weapons acquisitions.

Therefore, funds had to be made available for acquiring new equipment and or the modernisation of the equipment that was already in service. The over all plans for modernisation could only be partially met due to ‘resource crunch and budgetary insufficiency’\(^2\). Under these circumstances, the Standing Committee on Defence recommended that the funds sought should be enhanced adequately\(^3\).

5.1 MAIN BATTLE TANKS (MBT): MILITARY BALANCE

The significant years with respect to the Arjun MBT project are1983—when the first prototype of the tank was ready, 1991/92—when trials of the fully integrated prototypes were held, 1992/93—when trials of the Pre Production Series (PPS) tanks

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\(^2\) Standing Committee on Defence (1995-96), Fourth Report, Tenth Lok Sabha, Ministry of Defence, Demands for Grants [New Delhi, 1995], p.7 and p. 13. The Committee was informed that the 'minimum inescapable requirements' were being met. Besides, economy measures were being implemented to restrict expenditure and steps were being taken to generate resources internally so as to 'enable the services to manage'.

commenced and 1996—when the project was officially declared as having concluded and the tank was handed over to the Army.

Between 1987 and 1997 Pakistan made three separate agreements with China and Ukraine to bolster its tank regiments. The first of them materialised in 1987 when Pakistan began to manufacture under license from China the T-69 MBTs. In 1990 it began to acquire T-85 II MBTs from China. Seven years later, in 1997, Pakistan placed an order for the acquisition of 320 T-80 UD MBTs from Ukraine in a deal worth US$ 550 million, deliveries of which began in 1997. The same year Pakistan entered into an agreement with Belarus for the purchase of 1,920 AT-11 Sniper Anti Tank Missiles for arming the T-80 UD MBTs. With these deals two new arms supplying countries made forays into South Asia. India reportedly attempted to stall the Pakistan–Ukraine deal through persuading Russia from delivering some of the components needed by Ukraine to manufacture the MBTs. However, India’s attempts did not bear fruit.

Pakistan’s neighbour Iran has also been expanding its tank regiments since 1986. It had placed orders for the Chinese T-59 MBT in 1986 and the first of them was delivered in 1987. The delivery of T-59 MBTs was completed in 1988 by which time an estimated 240 of them were delivered. Besides, it had purchased some ninety T-59

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5 The transfers were to be made between 1992 and 1996. As in 1996 an estimated 282 MBTs were transferred by China. See SIPRI Yearbook, 1997, p. 350.
7 Ibid.
8 Between 1992-96 and 1993-96 Ukraine retained the twelfth rank among a list of the world’s thirty leading arms supplying countries while Belarus rose to the 18th position from being 19th during the same period. Ibid., p. 294.
MBTs from erstwhile Czhekoslovakia and also began to manufacture under license anti-tank missiles\textsuperscript{10}. Iran placed orders in 1990 for T-85 U MBTs and an estimated 282 MBTs were delivered between 1992 and 1996\textsuperscript{11}. Between 1993 and 1998 Iran received an estimated 122 T-72 MBTs, orders for which were actually placed in 1989\textsuperscript{12}.

5.1.1 Replacement and Modernisation

As has already been stated earlier, the \textit{Arjun} project was lunched in 1974. Owing to severe time-slippage in the project India had to replace the older generation tanks as well as undertake the modernisation of existing tanks.

On the eve of commencing the \textit{Arjun} project India’s MBT inventory consisted of 200 Centurions, 1,000 T-54s and T-55s and 500 \textit{Vaijayantas}\textsuperscript{13}. In 1982, the projected year of completion of the \textit{Arjun} project, India possessed 2,128 MBTs\textsuperscript{14}. Between 1978 and 1982 the total number of MBTs that India came to possess rose by more than four hundred. By 1982, the outdated Centurions were replaced. India signed an agreement with the Soviet Union in 1980 for the purchase of 500 T-72 tanks and their subsequent manufacture in India under license\textsuperscript{15}. Four years into the T-72 agreement and after deliveries commenced, the total number of tanks in

\textsuperscript{10} \textit{Ibid.}, p. 280.

\textsuperscript{11} \textit{SIPRI Yearbook}, 1997, p. 311.


\textsuperscript{13} \textit{Military Balance}, 1973-74[London], p. 51.

\textsuperscript{14} \textit{Military Balance}, 1982-83, p. 85.

\textsuperscript{15} The first revision of the projected year of completion and the financial cost involved was made in 1980, the year that India signed an agreement with the USSR for the purchase and subsequent indigenous manufacture under license of the T-72 tanks.
the Indian inventory in 1984 rose to 2,900\textsuperscript{16}. In 1996, the year the \textit{Arjun} was officially handed over to the army, the tank regiments consisted of 3,500 MBTs—700 T-55, 1,100 T-72 and 1,700 \textit{Vaijayanta}\textsuperscript{17}. At the same time, Pakistan possessed more than 2,500 MBTs—mostly Chinese origin tanks, which included the T-59, T-69 and T-85. China on the other hand had between 8,000 to 8,500 MBTs. Presently, the strength of the MBTs in India’s tank regiments has come down to 3,400. These consist of T-72s (estimated 1,500), 700 T-55s and 1,200 \textit{Vaijayantas}\textsuperscript{18}. Though the number of MBTs possessed by Pakistan has also come down to 2,120\textsuperscript{19} it is re-equipping itself with the T-80 UD MBTs. Between 1996 and 1998 China’s MBT strength has marginally gone up to 3,800\textsuperscript{20}. Under these circumstances and also because the \textit{Vaijayantas} are gradually being phased out, India would need to look for replacements in order to maintain the strength of its tank regiments.

Probably, a lesser number of T-72 tanks would have been procured if the \textit{Arjun} project proceeded as per schedule. It can also be argued that if the \textit{Arjun} was ready for production, the licensed production of T-72 tanks would not have been taken up, but a larger number of them would have been procured to meet the army’s requirements before \textit{Arjun} entered service.

The first indigenously manufactured T-72 rolled out of the Heavy Vehicles Factory (HVF) at Avadi in 1987\textsuperscript{21} (by 1987 the \textit{Arjun} tank project was behind

\textsuperscript{16} The breaks up is as follows: 800 T-54/55, 200 T-72 and 1,100 Vaijayanta MBTs. \textit{Military Balance}, 1984-85, p. 99.

\textsuperscript{17} \textit{Military Balance}, 1996-97, p. 159. An estimated 1,100 were in store.


\textsuperscript{19} Of the 300 ordered from Ukraine, at least 100 of them have already been delivered. See \textit{Ibid.}, p. 160.

\textsuperscript{20} \textit{Ibid.}

schedule by five years). Though there was a feeling of achievement that India could successfully assemble a tank (the T-72) that was supplied in a fully knocked down condition sight was not lost of the fact that the promise of delivering an indigenously designed MBT was yet to be kept. Addressing employees of the HVF, the then Defence Minister, K. C. Pant, said, “Only when we produce a tank with our own design will we able to get a rating on par with others in the field”\(^22\). While the assembling of the completely knocked down (CKD) T-72 was in progress, efforts also commenced to indigenise the tank in a phased manner. The delay in delivering the \textit{Arjun} tank, thus, resulted in: a) manufacturing the T-72s indigenously under license and b) indigenising the T-72s.

Besides, the \textit{Vaijayanta} tanks were modernised under Project Bison\(^23\). According to this plan, the \textit{Vaijayantas} were classified as Mark-1A, Mark-1B and Mark-1C depending on their vintage\(^24\). On this basis, the degree of modernisation (in the ascending order) that was needed to be undertaken was decided—Mark-1C was to serve the longest and Mark-1A was to serve for the shortest period; Mark-1A was planned to be in service till 1995, Mark-1B till 2000 and Mark-1C till early next century\(^25\).

The \textit{Arjun} project was reviewed once again in May 1987 and the year of completion of the project was revised to March 1993. The poor performance of the \textit{Arjun} tank in static mode firing during the summer trials of 1992 gave rise to the speculation that the government would sooner or later decide to make off-the-shelf

\(^{22}\) \textit{Ibid.}  
\(^{23}\) The modernisation plan covered 24 regiments.  
\(^{25}\) \textit{Ibid.}
purchase of tanks from abroad. Reportedly, negotiations were commenced with General Electric of the United States; this did not materialise.

Though the army felt that the T-72 tanks needed to be upgraded this proposal was not immediately pursued. One of the reasons for not modernising the tank regiments was that the army was facing financial constraints. This led to a situation where the army had to continue to retain the obsolescent Vaijayanta MBTs though they could have been replaced by the T-72s, which were already being produced indigenously under license. Moreover, if the Arjun were ready for induction the Vaijayanta would have been gradually phased out.

Besides, the modernisation of T-54/55 was also taken up during the VIII Plan under various projects viz. Mayflower, Sunflower, Gulmohar and Panther. For modernising the T-55 tanks the original plan was to import the fire control system from Yugoslavia. It was proposed to import the same at a cost of U. S.$ 15 millions. This, however, suffered a set back due to the United Nations 'embargo on Yugoslavia'. The proposal to import the fire control system, which did not ultimately materialise, was handled in a ham-handed manner, that too at a time when modernising the tank regiments was a serious requirement. The Comptroller and

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26 Asian Recorder, Vol. 38, no. 36, 2-8 September 1992, p. 22546. The government pinned a lot of hope on the Arjun tank and owing to its poor performance reluctantly commenced the negotiations. However, experts did not favour the acquisition of American tanks as they feared that they would not be able to perform well in the desert areas of Rajasthan. The basis of the doubt was the inadequate performance of these tanks in the Gulf War. These tanks could not perform well during the Gulf War because they have not been designed to operate in desert conditions.


28 Indian Express (New Delhi), 9 January 1996.

Auditor General (CAG) 'questioned the wisdom' of approaching for a control system, a country that was beset with internal uncertainty 30.

Moreover, the army decided to modernise the T-72 tanks during the Eighth Plan31. The modernisation programme of the T-72 tanks seems to have benefited from the technologies developed for the *Arjun* tank. The Defence Secretary informed the Parliamentary Standing Committee on Defence that the T-72 tank "is fully modernised by the DRDO... This is a wholly indigenous effort with certain imported components and sub-systems"32.

That apart, proposals are being considered but have not yet been finalised to procure the latest generation T-90 MBTs from Russia. The proposal seemingly has support at least in some sections. Some of the officers in Indian Army have put forward the argument that the T-90 is needed to counter Pakistan's acquisition of the Ukrainian T-80 UD MBTs33. One commentator wrote recently that the T-90 is one of the best MBTs and that the army has a long experience in employing Russian MBTs and would hence be able to familiarise itself with the tank without much difficulty34. However, the Ministry of Defence is 'reluctant' to support the procurement and subsequent production under license of the T-90 as "it would kill the *Arjun*."35.

30 Reported in *Hindustan Times* (New Delhi), 22 June 1998. Indian representatives couldn't be sent to inspect the fire control system. Moreover, India failed to encash the bank guarantee even when there was scope for doing so and while the fire control systems were not coming through. This resulted in a loss of nearly Rs. 28 cr.
32 Ibid., p. 12 and p. 13. The tank was modernised especially on two aspects: enhancing night fighting capability and ammunition capacity—penetration and accuracy.
34 Kothari, n. 27.
As of now the tank regiments consist of an assortment of older generation tanks and relatively modern tanks but not belonging to the latest generation. The army continues to employ the 1960s vintage Vaijayanta MBTs, the T-55 MBTs, besides the Russian T-72 MBTs.

A senior retired army officer warned as early as in 1978 that strategic mobility was an important aspect that needed to be taken care of while designing the Arjun tank. The dimensions of the tank have to be such that its transportation by railroad should not be a difficulty. The Arjun tank is reported to be wider by six centimetres than the three centimetres permitted for it being transported by railway wagons.

Whereas the army had asked for an MBT whose weight would be around 50 tonnes it shall now be operating a 60 tonne-weight tank. The official figures available suggest that the tank has a weight of 58.5 tonnes. However, the Pre Production Series (PPS) tank weighed 61.5 tonnes. This caused frequent failures in the imported RENK transmission, which, according to the army, performed at its ‘optimum’ when the tank weighed 58.5 tonnes. “The DRDO stated in November 1997 that the weight will not be allowed to go beyond 60 tonnes”37. The inferences that could be drawn from the above are: (a) the weight of the production tank would be more than what was envisaged, which makes the tank less mobile; and (b) the army was not satisfied with the performance of the transmission, which necessitated making improvements on it;


37 Government of India, Report of the Comptroller and Auditor General of India (henceforth CAG Report), Union Government(Defence Services), Army and Ordnance Factories, No. 7, 1998, Design and Development of main battle Tank—Arjun [New Delhi, 1998], para 26.9. The DRDO contends that the inadequate performance of the transmission is not on account of the weight of the tank, but because of a ‘failure of externally mounted brazed tubes, which has been rectified’. 

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As the army does not possess suitable rail wagons to transport the tank the same were designed by RITES “at an estimated cost of Rs. 1.65 crores”.

Until an indigenously developed engine is integrated with the Arjun it shall be operating with the imported German MTU engine. Despite more than two decades of R&D an indigenous engine is yet to be developed. It is proposed to progressively indigenise the Arjun. In the interim, it is dependent on foreign sources for the fire control and gun control systems. The task that lies ahead is indigenising its imported sub-systems.

5.2 AIRCRAFT: MILITARY BALANCE

According to original plans, the LCA should have been inducted in 1990. However, by 1989/90 the PDP alone was completed. The significant milestones in respect of the LCA are 1989/1990—when the project definition phase (PDP) was completed, 1992—when significant work on full scale engineering and development (FSED) commenced and 1995—when the first Technology Demonstrator (TD) rolled out and 1998—when the United States unilaterally withdrew from an agreement on joint-development of the LCA’s fly-by-wire system.

Even as the LCA project was facing several hurdles in its progress, Pakistan and countries belonging to West Asia and South East Asia began to procure modern aircraft. The induction of fighter aircraft into the airforces of the respective countries

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38 Ibid., para 26.11. Given the excess weight and size of the tank additional charges shall have to be paid to the Railways for its transportation as well as for the return journey of the specially designed empty wagons.
of the two regions was more visible especially during the later half of the nineties. That apart, some of the aircraft procurement deals signed during the later half of the eighties began to materialise in the early nineties. Together, the procurements significantly added to the air power of these countries. The United States and France were the major suppliers of the aircraft while Russia and the United Kingdom too conducted transactions. Along with the aircraft deals these countries had also signed agreements to equip the aircraft with advanced Air-to-Surface Missiles (ASM) and or Air-to-Air Missiles (AAM), which included the Maverick, Sparrow and Sidewinder missiles.

Between 1984 and 1986, Pakistan bought an estimated 40 F-16 aircrafts and signed an agreement with China to procure 60 F-7s to be followed by their licensed production in Pakistan. In 1989, Pakistan placed orders for the procurement of 71 F-16 aircrafts from the United States, which was financed by Saudi Arabia. Indonesia placed orders 12 F-16 aircrafts in 1986 from the United States and acquired Su-30 and the Hawk-100 fighter/ground attack (FGA) aircrafts from Russia and the United Kingdom respectively. Between 1994 and 1996 Singapore acquired 30 F-16 FGA aircrafts from the United States. Thailand strengthened its inventory of aircrafts by procuring 12 F-16s and 8 F/8-18 fighter aircrafts in 1991 and 2 Skyhawk FGA/trainer aircrafts in 1996. Malaysia procured 48 Skyhawk

39 SIPRI Yearbook, 1986, p. 393. Besides it had also sought to procure an additional 40 F-16s.
41 The deal was worth US$ 337 million. SIPRI Yearbook, 1990, p. 279.
43 Of these twelve were given on lease for training purposes with an option to purchase them in 1999. SIPRI Year Book, 1997, p. 327.
fighter/bombers in 1986 and 8 Tornado IDS FGA aircrafts. Similarly, in West Asia also several countries began to augment their respective airforce fleets— in 1992, Saudi Arabia signed a US$ nine billion worth agreement with the United States for procuring 72 F-15 FGA aircrafts and in 1993 it ordered 60 Hawk 200 and 48 Tornado IDS FGA aircrafts from the United Kingdom in a US$ 320 million-worth deal; Jordan acquired 16 F-16s, of which twelve were on a lease; France supplied 12 Mirage 2000 FGA aircrafts to Qatar in 1994 in a transaction worth US$ 1.25 billion; and the UAE received 30 Mirage 2000 FGA in a deal worth US$ three billion, which also included the modernisation of 33 Mirage aircrafts acquired earlier.

In 1990, the Indian Air Force (IAF) had a total number of 20 MiG-21 squadrons numbering 320 aircrafts in all. In 1990, the total number of MiG-21 aircrafts came down to 308. In the same year, the total number of combat aircrafts in service were 833. At this time, the Chinese had 5,070 combat aircrafts while Pakistan possessed 470 combat aircrafts. By 1992, the number of MiG-21 aircrafts in service with the IAF marginally came down to 294. While Pakistan had 352 combat aircrafts India’s combat aircrafts strength fell to 674, between 1990 and 1992, and China possessed an estimated 4,970 combat aircrafts. By 1995, the total number of MiG-21s rose to 388 and the strength of combat aircrafts increased to 844. On the other hand, Pakistan possessed 430 aircrafts in 1995, while China maintained previous levels and

45 SIPRI Yearbook, 1990, pp. 286-87.
possessed 4,970 combat aircrafts\textsuperscript{50}. However, the strength of the (Chinese) People's Liberation Army Air Force was bolstered due to its acquisition of the Russian made Sukhois. The strength of the MiG-21s has recently dropped at an alarming pace\textsuperscript{51}. Presently, the MiG-21 squadrons comprise of 314 aircrafts, a sharp fall of 74 aircrafts in three years—comprising nearly three squadrons\textsuperscript{52}. Besides, the total number of combat aircrafts in squadron service with the IAF has also come down to 772 while Pakistan nearly maintains past numbers and possesses 410 combat aircrafts and China possesses 3,566 combat aircrafts\textsuperscript{53}.

Even as several countries of concern to India were expanding their respective squadrons India continued to employ a significant number of MiG-21 aircraft which should have been replaced by the LCA. Most of the problems that the IAF is facing today are attributable to the time-slippage in the LCA project\textsuperscript{54}.

5.2.1 Modernisation of MiG aircraft

The LCA is required to replace the large number of MiG-21 variants in service with the IAF\textsuperscript{55}. They are Mig-21, MiG-21 bis, Mig-21-FL, Mig-21 PF, Mig-21 PFMA.

It was stated before the Standing Committee of Defence that the IAF has to replace a

\textsuperscript{50}Military Balance, 1995-96, p. 178.

\textsuperscript{51}147 aircrafts were lost during the period 1991-97. Most of these are the MiG-21s. The reasons for the air accidents are one, human error and two, technical defects and deficient operation and or maintenance procedures adopted by the Hindustan Aeronautics Limited. For more details see.

\textsuperscript{52}Military Balance, 1998-99, p. 157. Also see CAG Report, Union Government (Defence Services), Air Force and Navy, No. 8 of 1998, Air accidents in IAF, [New Delhi, 1998], para 7.3.

\textsuperscript{53}Military Balance, 1998-99, p. 161 and p. 180. The number of Sukhois has also gone up with more deliveries being made. They now stand at 46.


\textsuperscript{55}“The Great Indian Hope: Its Light Combat Aircraft Programme (LCA)”, Vayu Aerospace Review [New Delhi], Vol. 25, no. 6, 1996, p. 32.
‘substantial portion of its combat fleet by the first decade of the next century’. Meanwhile, it was believed that Pakistan would acquire F-16 aircrafts (in addition to those that were already in service with the Pakistan Air Force [PAF]).

It was pointed that the existing fleet of MiG series aircrafts would not be able to meet the operational requirements of the future. In order to maintain its preparedness the IAF had to choose between two options—either acquiring new aircrafts or modernising the existing ones. Since the airforce was already experiencing a resource crunch it was left with no other alternative than to modernise the existing MiG-21 and MiG-27 fleets; the Standing Committee on Defence noted that ‘acquiring new, state-of-the-art aircrafts was beyond [the] financial capability [of the airforce].

The pressing need to undertake the modernisation programme in spite of a resource crunch could be gauged from the reasoning provided by one commentator. The reasoning was that ‘though the modernisation programme would involve incurring a fresh debt (two MiG-21 bis are being modernised in Russia, with more to be modernised in India) “it would reduce excessive fluctuations in force levels and defence preparedness”’. Meanwhile, defence commentators began to highlight the urgency of modernising the MiGs. One commentator noted that the modernisation programme was yet to be finalised and this, he wrote, “will have to be backed afresh”.

60 Atul Aneja, “Indigenisation Will be Mulayam’s Immediate Task”, The Hindu (Madras), 3 June 1996. The context of the comment was that there was a change of government at the Centre with the United Front replacing the Congress Party.
The MiG-21 upgradation programme was meant to provide modern avionics and “enhance...[their] weapons carrying and delivering capabilities”61. Negotiations were conducted with Russia for more than two years to finalise the technical aspects of the modernisation programme and a contract was signed in March 1997 for upgrading its avionics, radar and weapon system to increase “its total technical life so that they could be put in operation till [the year] 2010”62. The programme is likely to be completed by the year 2002.

It is hoped that the LCA would enter service at the earliest and begin to replace the MiG-21 series aircrafts, thus fulfilling the objective with which the LCA project was commenced. However, analysts are sceptical about the year in which the LCA would enter squadron service. According to one analyst, “It is extremely unlikely that the IAF would have a four-squadron force of [the LCA] till 2015”63.

5.3 MISSILES: REPLACEMENT

It was reported during the last week of December 1992 that an Indian defence delegation discussed with a visiting French defence delegation the prospects for renewing the contract to produce indigenously under license the Milan anti-tank missiles64. In its Annual Report the Ministry of Defence stated that it had stepped up

61 “Portents of India’s Emerging Air Power”, Interview with the then Chief of Air Staff, Air Chief Marshall S. K. Kaul, National Herald, 15 March 1995. It was also stated during the interview that 1st0 Mig “bis aircraft would be modernised at an estimated cost of Rs. 1,000 cr. Two years later it was estimated that the modernisation programme would cost Rs. 1200 cr; see Ajay Singh, “Rearm While You Repay”, Indian Express, 21 August 1997. The programme is to be conducted over a five year period. Also see Standing Committee on Defence, 1995-96, Fourth Report, Demands for Grants, n. 2, p. 20.

62 Standing Committee on Defence(1998-99), Second Report, Twelfth Lok Sabha, Ministry of Defence, Demands for Grants[New Delhi, 1998], p. 17. It has been proposed to upgrade 125 MiG-21s. The programme has already commenced and two aircraft were going through the design and development phase, after the completion of which series upgradation of the remaining 123 aircraft would be taken up.

63 Joshi, n. 54, p. 56.

64 The Hindu, 31 December 1992.
the production of Milan ATGMs. While the latest generation Nag ATGM is yet to enter production phase a larger number of older generation Milan ATGMs are being produced. Presently a number of older generation SAMs are being employed, while the Akash and Trishul SAMs are yet to be cleared for production.

To sum up, as a result of the delay in the completion of Arjun, the army had to look for replacements as well as modernise the tanks that were already in service. This has led to a situation where the older generation Vajyantais, which were to have been replaced by the Arjun, have not only been retained in service but had also to be modernised later in order to meet the requirements of the army. The T-72 tanks entered service at around the same time as the Arjun should have been ready for production. At least, their licensed production would, probably, not have been taken up if the Arjun project was completed on time. Now, while the T-72 modernisation project has been taken up there are also pleas for the acquisition of T-90 MBTs followed by their licensed production. Such an event does not bode well for the future of the Arjun.

The LCA was planned to replace the MiG-21 series of aircrafts. However, due to the delay in the completion of the LCA project India is presently undertaking the modernisation of the MiG-21 aircrafts. Also, in recent years the combat aircraft strength of the airforce has rapidly decreased. If the LCA project was completed on time, the air force would not have faced the many problems that it is encountering today. Recently, taxi trials of the LCA after the national team that was set up to complete the development of the FBW system accomplished the task. The results of these tests shall determine when the maiden test flight of the LCA would be held.

India continues to employ foreign-origin SAMs and ATGMs and these are yet to be replaced by the Akash, Trishul and Nag missiles.

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