

Issue Brief

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HOW NOT TO RUN A MILITARY R&D PROJECT: THE CASE OF ARJUN MBT

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This paper analyses the contribution of India's military research and development (R&D) at attaining self-reliance in defence technologies and weapon systems thereby reducing its reliance on foreign suppliers. The long-term security implication of reducing costs and saving foreign exchange is also examined with the Arjun Main Battle Tank (MBT) as a test case.

The Arjun MBT programme is a perfect example of how a military R&D project should not be conducted.

OBJECTIVES OF ARJUN MBT PROGRAMME

The Indian Army experienced certain shortcomings in the performance of the *Vijayanta* tank in the 1971 India-Pakistan War. Its gear box and diesel engine were not sturdy enough under battle conditions, though the performance of its gun was far better than that of any Russian gun¹. Therefore, project *Arjun* MBT was launched with the objective of replacing the *Vijayanta*². However,

after declaring the project as successfully completed

highly time consuming and could even prove to be counter-productive. See *Hindu*, October 29, 1974. Thus, the *Arjun* programme was initiated with the objective of replacing the *Vijayanta* with the new tank. The project was initiated by the first director of the Combat Vehicles Research and Development Establishment (CVRDE), the late Mr. Mukherjee, along with a 'limited team of technicians', who were later 'joined by a large body of technologists, technicians and tradesmen', to design the MBT and most of its sub systems. See TS Subramanian, "Battle Ready: MBT set for production", *Frontline*, Chennai, March 8, 1996, p. 13. The project was started in March 1974 and series production was supposed to have commenced in 1983. However, the first prototype itself was not ready for technical evaluation until 1983, by which time the tank should have been, according to plans, in the final phase of pre-production series tests. Consequently, the year of making the first prototype available for technical evaluation was revised. After a series of trials, officially the project was declared as successfully completed after, on January 9, 1996, the then Prime Minister, P V Narasimha Rao, handed over the *Arjun* tank to the Army, at a function in New Delhi, in the presence of the Chief of the Army Staff. Besides, plans were also made at the time to induct *Arjun* into service during the Ninth Plan. See Ministry of Defence, *Annual Report, 1995-96*, p. 54. However, that has not been the case, and there is no firm word on when production of the tank and its eventual induction would materialize.

¹ See the report by G. K. Reddy, "Search for Advanced Tank by the Army", *Hindu*, Chennai, January 30, 1979.

² Echoing similar opinion, a former Lieutenant-General writes, "The design of the *Vijayanta* had the major defect of not being suitable to the dust and heat conditions of Punjab and Rajasthan. The modifications suggested were carried out. Nonetheless, it was realised that major changes were required if the quality of performance of the tank had to improve". See KP Candeth, "Research and development in the Defence Forces", *Indian Express*, New Delhi, August 23, 1977. Therefore, it was decided to develop a new tank altogether, because modifying an existing tank could be

and manufacturing 125 *Arjun* MBTs that were handed over to the Army, nothing more was heard of the project.

WHAT WENT WRONG?

Three main reasons for the delay were cost-escalation, inadequate project management and technological complications.

COST ESCALATION

Like many other projects of the executing agency, the Defence Research and Development Organisation (DRDO), the *Arjun* MBT project, too, faced financial constraints, till the Full Scale Engineering and Development (FSED) phase commenced. In the *Arjun* project the main reason for non-availability of funds initially and high cost-overruns were the DRDO's practice of deliberately underestimating project cost at inception. Overtaken by an eagerness to indigenously design and develop an MBT and apprehending that the project would not be sanctioned if the cost was high, the DRDO deliberately under-evaluated the project cost. For the *Arjun* project "... [t]he amount we asked for (financial support) was trivially low. My sympathies are, however, with the scientists. In their eagerness to develop a tank indigenously they totally lost credibility with... time frames", a former DRDO Director General said.³

The DRDO has not been able to run defence R&D projects within the allotted budget even with their

own estimates, implying that the DRDO has not been able to effectively visualise the financial requirements of projects. Giving evidence to the Parliamentary Standing Committee on Defence, then DRDO Director General said, in the context of the LCA project, "After technology up gradation, we went for full estimation and now we can estimate the overall cost better than previously"⁴.

Over a period of time, the cost of the project rose 21 times. It was initially sanctioned at a cost of Rs. 15.5 cr. The cost estimate of the project in May 1987 was Rs. 280.8 cr. At its launch in 1974, the project had a foreign exchange (FE) component of Rs. 3.7 cr. However, after the second revision this rose to Rs. 102.32 cr.—a whopping 27.65 times more than the original estimate. The foreign exchange component at the project's closure was Rs. 113.82 cr.

After the DRDO carried out some of the improvements suggested by the Army the project was officially declared as concluded. However, some more improvements had to be made but by that time, the DRDO had exhausted the money. "The MBT project was closed... apparently to bring the cost of the project within the ambit of the sanctioned amount... in order to comply with... the recommendations of the PAC (Public Accounts

³ See the interview with V. S. Arunachalam, *Hindu*, August 5, 1992. The interview was conducted shortly after he laid down office as the Director General of DRDO.

⁴ Standing Committee on Defence (1995-96), *Fifth Report*, Tenth Lok Sabha, Ministry of Defence, *Defence Research and Development—Major Projects* [New Delhi, 1995], p. 17.

Committee)⁵. In its report, the PAC stated that "... a very strict watch should be kept by the Ministry to ensure that the expenditure is contained within the sanctioned estimate of Rs. 280.80 crores"⁶.

To carry out the improvements and for product support, two separate projects totalling Rs. 41.98 crores were sanctioned, which involved a FE component of Rs. 11.5 crores⁷. In all, Rs. 322.78 crores, including a FE component of Rs. 113.82 crores, were spent on the *Arjun* project.

The DRDO had to resort to means other than approaching the Cabinet Committee on Political Affairs (CCPA) to secure the funds. The amount was provided for from the budget of the Ordnance Factories.

The more a project gets delayed the more the cost of the project rises, because of variation in FE rate and inflation and also, because of project under valuation.

⁵ CAG Report, Union Government, Defence Services, No. 7 of 1998, *Design and Development of main battle tank ARJUN* [New Delhi, 1998], para 26.12.

⁶ Public Accounts Committee(1988-89), *Hundred and Sixty Eighth Report*, Eighth Lok Sabha, Ministry of Defence, Department of Defence Research and Development, *Development of Weapon System X*, [New Delhi, 1989], p. 5. The X in the title of the Report refers to the *Arjun* MBT Project. Also see Public Accounts Committee (1991-92), *Twenty Sixth Report*, Tenth Lok Sabha, Ministry of Defence, Department of Defence Research and Development, *Development of Weapon System X* [New Delhi, 1992].

⁷ CAG Report, *Design and Development of main battle tank ARJUN*, para 26.13.2

PROJECT MANAGEMENT

The project was also inadequately monitored and with insufficient guidance, the lost direction for a long time.

On paper, there was a 'high level working group' and a 'steering committee' to monitor the project. The 'working group' was expected :

- i to progress the development of the [Arjun project] in a coordinated manner
- ii to meet once [every three months] or earlier if necessary; and
- iii to submit a progress report once in six months to [the] Steering Committee so as to bring such matter to its notice where... help and guidance was necessary.

It was, however, discovered in 1989 by the Public Accounts Committee (PAC) that the 'working group met only 14 times; It should have conducted at least 60 meetings between 1974 and 1989. Besides, the 'steering committee--which was formed to supervise the 'working group'--met 17 times; it should have held 30 meetings, once every six months⁸.

TECHNOLOGY COMPLICATIONS

The project was also delayed because its scope was altered midway.

⁸ *Ibid.*

The reasons for the delay then Defence Minister, Sharad Pawar, told the *Rajya Sabha*, were⁹:

- i. Change in qualitative requirements (QR);
- ii. Requirement of additional prototypes;
- iii. Additional requirement of pre-production series (PPS) tanks; and
- iv. More realistic assessment of technical and user trials.

Several features of the tank had to be modified to keep it state-of-the-art and incorporate the experience gained during technical evaluation and user trials. Meanwhile, with technological advancements, the demand for enhanced firepower, mobility and protection—the three most important features of a tank—grew, necessitating alterations in the General Staff Qualitative Requirements (GSQR), whereby the Army demanded “a state-of-the-art tank, designed to take care of threats of 2000 and beyond”¹⁰. As armour strength grew, the capability of the ammunition to defeat enemy armour had to be improved. To enhance tank protection, the composite *Kanchan* armour was finally developed. Thus, improving every important feature of the tank became extremely vital. While improvements of one feature were being validated another had to be improved.

⁹ See *Rajya Sabha Debates*, July 20, 1992, Monsoon Session, Q. No. 176 and the evidence given by Abdul Kalam in Standing Committee on Defence (1995-96), *Fifth Report*, p. 22.

¹⁰ *Ibid.*

The first prototype of the tank was subjected to user trials in 1983. Between 1983 and 1986, four prototypes were handed over to the Army for trials. Then, six more prototypes had to be developed and committed to trials. The initial plan was for testing 12 Pre Production Series (PPS) tanks. Even after this, it was felt that some more PPS tanks, which incorporated modifications suggested by the Army, had to be tested, though the Army accepted *Arjun*. Finally, a total of 42 PPS tanks had to be made and sent for trials.

IMPLICATIONS OF DELAY IN PROJECT EXECUTION

Owing to the delay, the Army had to retain older generation tanks for longer periods and modernise tanks such as the T-54/55 and *Vijayanta*,¹¹ besides making off-the-shelf purchase of latest generation tanks and their subsequent licensed production in the country.

In 1980, an agreement to buy 500 T-72 tanks and subsequently manufacture them in India under license was signed with the then Soviet Union¹². Probably, a lesser number of T-72 tanks would have been procured had the *Arjun* met with its target date. It can also be argued that if the *Arjun* was

¹¹ The modernisation of T-54/55 was also taken up during the VIII Plan under various projects viz. Mayflower, Sunflower, Gulmohar and Panther.

¹² 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.

ready for production, the licensed production of T-72 tanks would not have been taken up, but merely the required numbers (even if that number was significant) would have been procured.

When the first indigenously manufactured T-72 tanks in 1987 rolled out, the then Defence Minister, KC Pant, told employees of the HVF, “Only when we produce a tank with our own design will we be able to get a rating on par with others in the field”¹³. 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. Moreover, the army decided to modernise the T-72 tanks during the Eighth Plan¹⁴.

Thus, delay in delivering the *Arjun* tank, resulted in (a) manufacturing the T-72s indigenously under license and (b) indigenising them; and (c) modernising them.

A heartening feature, however, is the modernisation programme of the T-72 tanks seems to have benefited from the technologies developed for the *Arjun* tank. The then 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”¹⁵.

¹³ *Asian Recorder* [New Delhi], Vol. 33, no. 42, October 15-21, 1987, p. 19696.

¹⁴ Standing Committee on Defence (1995-96), *Fourth Report*, p. 7.

¹⁵ *Ibid.*, p. 12 and p. 13. The tank was modernised especially on two aspects: enhancing night fighting capability and ammunition. capacity—penetration and accuracy.

In 1999, as *Arjun* was not ready, an agreement was signed with Russia to buy off-the-shelf 124 T-90 MBTs and assemble within India another 186 tanks from Semi-Knocked Down (SKD) and Completely-Knocked Down (CKD) kits, making a total 310 tanks¹⁶. The last batch of these was subsequently delivered at Niizni Tagil, at a function held on April 5, 2004, on the premises of Uralvagonzavod¹⁷.

LESSONS LEARNT

Some of the lessons to be learnt in the wake of the *Arjun* MBT project are:

1. Underestimating the project cost should be avoided.
2. Project monitoring has to be rigorous.
3. Close co-ordination is essential between the DRDO and the user service.
4. The technique adopted by the DRDO in executing other projects viz conducting projects in a mission mode in a consortium approach with concurrent engineering should be applied to all major projects.

¹⁶ The agreement was signed on February 15, 2001 in New Delhi. It is worth an estimated US\$ 650 million. *Hindu*, February 16, 2001. The first indigenously assembled T-19 rolled out of the Heavy Vehicles factory in Avadi, Tamil Nadu, in January 2004. *Hindu*, January 8, 2004. At the time, it was also announced that the T-90s have been named *Bhishma*.

¹⁷ *Hindu*, April 6, 2004.

5. Indian industry should be adequately equipped to mass produce weapon systems and equipment developed by the DRDO.

Difficulties should be anticipated in advance and alternate solutions should be planned.

WHAT LIES AHEAD?

Three things seem to be apparent. One, mid-life upgradation of older generation tanks, two indigenous manufacture under license of newer generation tanks and three, off-the-shelf purchase of latest tanks. In effect, until the series production of Arjun MBT is taken-up the objective of being self-reliant in defence technologies and defence production would not be met.

After two decades of R&D, when the Arjun enters the production stage, it will have a German MTU engine and the fire control and gun control systems would be imported.

The immediate task that lies ahead is indigenising its imported sub-systems. And the mid to long-term task is attaining increased self-reliance in defence technologies and production.

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