The Amazing Story of Akash and the Way Forward

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The story of indigenous defence technology proving to be a game-changer is often inadequately reported. During Operation Sindoor, the indigenously developed medium-range Akash missile allegedly shot down a PAK JF-17 Thunder, jointly developed with China, in the Kashmir region. This medium-range surface-to-air missile (SAM), with a 25–45 kms intercept range, supersonic speed, and active terminal guidance, can engage up to four targets simultaneously with 24 ready-to-fire missiles. It successfully neutralised Pakistan military's attempts at large-scale drone and missile attacks on multiple military installations across northern and western India during the night of 7–8 May, and the air defence (AD) system at Lahore was neutralised.

Indo-Soviet Defence Partnership

Russia has been the most stable and potent strategic partner after the 1962 Chinese debacle, with a slew of technology transfer partnerships, starting with Mig-21 aircraft in 1963. Be it tanks (T72 & T90), frigates, missiles or SU-30 aircraft, a large amount of the defence inventory is sourced from Russia.

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In the area of cruise missiles, Dr A.P.J. Abdul Kalam crafted a Joint Venture (JV) with Russia, which has since segued into the production of supersonic cruise missiles in the range of 290–800 kms, which can be launched from land, ship, air and even submarines. Undeterred by US' unhappiness, India signed a deal for five squadrons (16 vehicles each) of S-400 for US$ 5 billion, of which three squadrons have since been received.[1] One of the squadrons is deployed in Srinagar and Pathankot, and one in Rajasthan and Gujarat. With a range up to 400 kms, speed to engage targets moving at a speed up to 14 Mach, it can engage targets at altitudes up to 56 kms. It can engage 80 targets simultaneously and is considered superior to the US' patriot system. China purchased them in 2014 and they are proving to be most potent in deflating drone and missile attacks from Pakistan.

The Akash Story

The ambitious Integrated Guided Missile Development Programme (IGMDP), was supervised by Dr A.P.J. Abdul Kalam, a strong advocate of self-reliance in niche defence technologies, in 1982–83. The programme witnessed remarkable success in the successful indigenisation and production of Surface-to-Surface Missiles in the range of 150–300 kms for all three services.[2] The long-range Agni Surface-to-Surface Missiles have also been a success. However, the medium-range Surface-to-Air Missile Akash and short-range SAM, Trishul, have been challenging cases of the overarching programme. The problems have been mostly in the guidance systems where collaboration was sought with France. Though the programme started in 1983, the development trials were undertaken in 1997, and it could intercept a live target in 2005.[3] There has been no looking back on this programme since then, with Armament Research and Development Establishment (ARDE) developing the nuclear warhead, High Energy Materials Research Laboratory (HEMRL) the propellant, Tata Power and L&T building the launcher, and BEL producing it. It is a successful synergy between developing agencies and public–private partnerships. It is 96 per cent indigenous and very potent against Unmanned Aerial Vehicles (UAVs) and aircraft, as demonstrated in Kashmir not too long ago. Countries like the Philippines, Vietnam, Egypt and Brazil have expressed interest in buying Akash missiles, while the upgraded version Akash-New Generation (Akash-NG) is in the pipeline. Though long delayed in its fruition, Akash missiles have demonstrated that we need to be patient with our self-reliance initiatives in critical technologies, where technology denial is possible.

The Quest and Challenge of Indigenisation

In matters of acquisition of major system, weapons and platforms, India has three choices, viz. to import (Buy), buy technology and produce at home (Buy & Make) or produce within India out of indigenous technology (Make).[4] While Mirage aircraft and Rafael now are clear examples of 'Buys', SU-30 aircraft or T72/90 tanks are examples of 'Buy & Make'. In the 'Make' category, we can put Light Combat Aircraft (LCA) or PINAKA as good examples. The Kalam Committee in 1993 had calculated that India's Self-Reliance Index (SRI) in critical defence technology was as low as 30 per cent.[5] The Committee had set a roadmap to achieve 70 per cent SRI by 2005, through design and development collaboration with reputed global design houses, JVs with OEMs (Original Equipment Manufacturers), faster absorption of technology and setting up facilities.[6] It identified certain sub-systems like propulsion (engines), weapons (air-to-air missiles), and sensors as bugbears of indigenous capability. However, it is worth noting that there is inadequate design capability of critical sub-systems in defence either in government or in the universities and the private sector. Further, the investment allocation for defence research is as low as 6 per cent of defence budget compared to much higher allocation by other developed countries.

It was because of Dr Kalam's vision that India has been able to develop Akash missiles (40 kms range) and Medium-Range Surface-to-Air (MR-SAM) missiles (70 kms range) in collaboration with Israel. Interestingly, one notices that even countries like the US are now willing to collaborate for building a stealth aircraft.[7] India needs to scale-up its design capability in niche technologies like passive sequence, focal plane array, and global positioning system through design, development and production collaboration.

The Challenges

India has the dubious reputation of being the second-largest importer of arms as per the latest SIPRI report. After the 1962 debacle, the Subramaniam Committee in 1964 had recommended that bereft of indigenous capability and depth in Indian engineering colleges, there is a need to collaborate with global engine houses like GE, SNECMA to produce gas turbine engines for fighter aircrafts. India went with the indigenous Kaveri engine programme instead, for the LCA fighter aircraft. However, India is still stuck with GE 404 engine from the US to power the successful LCA indigenous aircraft. Some of the major issues worth noting are inadequate design capability in university

and research laboratories, lack of high altitude wind tunnel and flight testbed and most importantly, lack of design and development collaboration with reputed engine design houses like SNECMA (France) and GE (USA).

India's Self-Reliance Index in defence technology has not substantially improved despite the optimistic narrative surrounding 'Make in India'. This is largely because of the lack of confidence of the defence services on the capability of DRDO for developing credible indigenous alternative subsistence in critical areas and inadequate investment in defence R&D, and a lack of partnership between the private sector, government and reputed design houses globally. There is also a perception that investment in DRDO needs to be improved from the present level of 6 per cent of defence expenditure to around 10 per cent. The DRDO budget including capital expenditure was Rs 26,812 Cr during 2025–26. This constitutes 6.8 per cent of defence expenditure which was around 3.93 lakh crores (excluding pension). However, the issue is not about allocation but lack of design capability and depth in advanced fields of defence sub-systems in India's engineering colleges including the Indian Institutes of Technology (IITs). IIT Kharagpur is an exception which has developed niche design capability in naval platforms and systems. For all the critical sub-systems identified like stealth, passive seekers, UAVs, FPAs, AESA radars and laser-guided munitions and air-to-air missiles, RLGs and GPS, the track record of DRDO is rather unenviable. The private sector, except for L&T, does not have a positive record in design capability just as defence public sector undertakings (PSUs) like the Hindustan Aeronautics Limited (HAL).

The Way Forward

While the Kelkar Committee strongly pitched for public–private partnership (PPP) in the defence sector and for providing level-playing field to the players, the private sector still remains a marginal player. While Prime Minister Modi is giving a fillip to the micro, small and medium enterprises (MSMEs), the big Defence PSUs still consider big private players like TATA and L&T as competitors and not collaborators. This is further roiled by India's scant attention to work on JVs with OEMs by making private sector partners, and moving away from technology transfer to outright buys, as happened in the case of Rafal aircraft, where a golden opportunity to have technology in niche areas like AESA radars, aircraft engines and seekers, was missed. The captive Defence PSUs have become more of integrators rather than value adders by indigenising at the component level. On the contrary, countries

like China, which have been availing of technology transfer for aircraft like SU-27 have successfully added value and even exported them to other countries like Malaysia. Dr Kalam used to say: 'an ignited mind is more powerful than anything on the earth, over the earth, and under the earth'. When asked to elaborate, he said he would like Surface-to-Surface, SAM to be the most potent in the world, LCA to replace dependence on imports substantially, and design and develop an indigenous submarine of world-class stature. Dr Kalam was convinced that self-reliance in strategic systems is the key to being respected as a global power. Thankfully, his vision of a SAM in the form of Akash and Prithvi surface-to-surface missiles has enabled India to repulse a rogue neighbour like Pakistan. What is now needed is to look for design collaboration with reputed design houses and JVs with OEMs to build our Military Industry Complex, instead of subsidising foreign arms manufacturers to fight India's war. The rhetoric of 'Make in India' should be realised in practice. War can be a great lesson in the importance of self-reliance in strategic systems, as China has demonstrated to the world.

Notes

1. 'India to Receive Final S-400 Missile Systems from Russia by 2026', *Defense News*, 2 June 2025, available at https://www.thedefensenews.com/news-details/India-to-Receive-Final-S-400-Missile-Systems-from-Russia-by-2026/.
2. 'IGMDP: India's Deadliest Missile Program', DefenceXP - Indian Defence Network, available at https://www.defencexp.com/igmdp-indias-deadliest-missile-program/.
3. S. Kulkarni,'Story of India's Akash Missiles That Nullified Pakistan's Aerial Attacks', *The Indian Express*, 15 May 2025, available at https://indianexpress.com/article/explained/story-of-indias-akash-missiles-that-nullified-pakistans-aerial-attacks-10007248/
4. 'Regulations and Procedures Governing Defence Procurement in India - Part I', Spice Route Legal, available at https://spiceroutelegal.com/publications/regulations-and-procedures-governing-defence-procurement-in-india-part-1/.
5. G. Balachandran and S. Any, 'In Defence of Our Defence R&D', *The Indian Express*, 20 May 2010, available at https://indianexpress.com/article/opinion/columns/in-defence-of-our-defence-r-d/.
6. S. Misra, 'Self Reliance Index and the Enduring Legacy of Kalam', *Indian Defence Review*, 15 October 2015, available at https://indiandefencereview.com/self-reliance-index-and-the-enduring-legacy-of-kalam/.
7. J. Tirpak, 'DARPA's No. 2 Sees Quantum Sensing as Threat to Stealth', *Air & Space Forces Magazine*, available at https://www.airandspaceforces.com/why-darpa-thinks-stealth-is-obsolete-in-future-wars/.