

India's Missile Programme in Peril

New Delhi: There it is, the sound of another prestigious 'Make in India' product being blasted out of the sky. After 32 years and over Rs. 1,000 crore later, the Akash missile system, crafted by India's white elephant DRDO to protect the country from possible aerial threats, has been declared a dud by the Indian Army. Now, the army is shopping for a suitable alternative abroad by terming the indigenously developed missile as 'inadequate to meet the army's requirement in a desired time frame'.

The move not only exposes India's missile defence vulnerability but also reveals the weakness in Prime Minister Narendra Modi's pet 'Make in India' push. To counter Akash, Pakistan has recently inducted its FM-90 air defence missile system, procured from PLA China, while on eastern front, China has HQ-7. This also brings into the shadow the fate and capability of India's missile programme worth over Rs 70,000 crore, and over a dozen missiles. It also raises the question of relevance and affordability of the country's premier defence research agency whose only notable successes have been packaged pickles or neem-based vaginal contraceptive cream.

Army headquarters is in process of acquiring nearly 2,000 air defence missiles to raise its two regiments with an estimated cost of `10,000 crore. On the basis of technical evaluation, three firms from Russia, Israel and Sweden are in competition to supply short-range missiles. In reply to The Sunday Standard, Army headquarters has claimed that the "targeted short-range surface-to-air missile (SRSAM) system is technologically and operationally superior to the Akash missile system, which DRDO took almost five years to develop." Further, the cost of the targeted SRSAM project is 70 per cent of the Akash missile system. In contrast, in May 2015, Army Chief General Dalbir Singh Suhag was all praise for Akash missiles. The cost of the targeted SRSAM project that the Indian Army is planning to acquire from abroad is 70 per cent of the Akash missile system.

In contrast, in May 2015, Army Chief General Dalbir Singh Suhag, while inducting two regiments of Akash missiles, had said: "It is a matter of great pride for the nation that today indigenous state-of-the-art 'Akash' air defence weapon system is being inducted into the Indian Army. The capability that we have with this system will ensure that it takes care of vulnerability of our assets. Akash is a step towards self-realisation of indigenisation".

Akash is an indigenously developed supersonic short range surface-to-air missile system with the capability to engage a wide variety of aerial threats like aircraft, helicopters and unmanned aerial vehicles up to a maximum range of 25 km and up to an altitude of 20 km.

The system, which has 96 per cent indigenisation, is capable of simultaneously engaging multiple targets in all weather conditions and is capable of providing comprehensive short-range missile cover to the vulnerable assets in the field force of the Army.

Akash is one of the five core missile systems of the integrated guided missile development programme, launched by DRDO in 1984. The Army had initially ordered two Akash regiments, with six firing batteries of a project cost of `19,500 crore. But in less than a year, it has changed its opinion on the home-made missile. "Army has proposed a composite approach of procuring SRSAM from globally and simultaneously technological improvement of Akash missile system," Army headquarters told The Sunday Standard.

When contacted, DRDO officials refused to comment on the army's claim.

RANGE 20 KM
Cost: \$45 mn*

Pakistan's FM-90 air defence missile system, procured from PLA China

Range: 20 km
Cost: \$17 mn*

Chinese HQ-7, short-range air defence missile system

Range: 20 km
Cost: \$10 mn*

* Cost per missile

AKASH MISSILE PROJECT LAUNCHED IN 1984

Sanction cost to develop ₹600 cr
First trial in 1990

Developing Cost escalated to ₹1,000 crore

DRDO claims: The cost of Akash is 8-10 times lower than the similar systems developed in other countries

Army counters: Foreign makes are cheaper by almost 70 per cent of Akash missile system

AN EYE ON NEIGHBOURS

INDIA	PAKISTAN	CHINA
<p>Agni-V Ballistic, Range: +5,000 km, Warhead: 1,000Kg</p> <hr/> <p>Prithvi-II Ballistic, Range: 350 km, Warhead: 500-1,000 kg</p> <hr/> <p>BrahMos Cruise, Range: 290 km, Warhead: 200-300 kg</p> <hr/> <p>K-4 SLBM, Range: 3,500 km</p>	<p>Half-2/Abadali Range: 180-200 km, Warhead: 250-450 Kg</p> <hr/> <p>Half-3/Ghaznavi Range: 290 km, Warhead: 700 Kg</p> <hr/> <p>Half-4/Shahen-1 Range: 750 km, Warhead: 700 Kg</p> <hr/> <p>Half-5/Ghauri-1 Range: 1,300-1,800 km, Warhead: 1,200 Kg</p> <hr/> <p>Half-6/Shahen-2 Range: 2,500 km, Warhead: 700 Kg</p>	<p>DF-II/M-11 Range: 384 km, Payload: 1,000 Kg</p> <hr/> <p>DF-15/M-9 Range: 280 km, Payload: 700 Kg</p> <hr/> <p>DF-21/JL-1 Range: 3,000 km, Payload: 700 Kg</p> <hr/> <p>DF-31/JL-2 Range: 7,200 km, Payload: 1,400 Kg</p> <hr/> <p>DF-41 Range: 12,000 km, Payload: MIRV</p>

Indigenous fighter aircraft to be a reality soon, says Parrikar

ROORKEE: India may be able to develop its own fighter aircraft with the help of indigenous and foreign technology in the next four to five years, Defence minister Manohar Parrikar said on Friday, while stressing on curbing the dependency in import in defence sector. "In four or five years we could develop our own fighter planes with the help of a mixture of indigenous and foreign technologies," he said.

Parrikar was in the city to launch a three-day annual technical festival of IIT Roorkee, which started on Friday.

Addressing the students, Parrikar said that under the 'Make in India' initiative, the focus of the government is to reduce the burden of import to a "noticeable extent" through the use of indigenous technology. The minister appealed to the "bright minds" of IITs and other areas to integrate themselves and give their services to the defence sector.

"Bright minds from IITs and other areas should integrate themselves with the country's defence sector and render their services to DRDO-like establishments to make the 'Make in India' campaign successful through your 'out of the box' thinking, creative ability, innovation and engineering knowledge," Parrikar said.

The minister said that people from industry, academia and technology-developing fields could be integrated with DRDO like establishments. "My first priority in this direction is to make a hassle-free and non-bureaucratic system for getting the entry in DRDO by these people," he said.

"We have earmarked over 120 items of defence requirements which we can be developed with the help of indigenous technology," the minister said.

On the occasion, the institute's chairman of board of governors Ashok Misra, director Pradipta Banerji, former chairman of Atomic Energy Commission PV Athawale, former Air Marshal T Suvarna Raju and defence journalist Ajai Shukla were present on the occasion.

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Parrikar looks to academia for innovative ideas in defence production

Defence ministry will actively collaborate with top academic institutions, including the IITs, NITs, IISc and other such institutions, to tap innovative ideas for defence production and development, defence minister Manohar Parrikar said.

The minister said he has already instructed defence units, including Defence Research and Development Organisation (DRDO) to tap academic potential for research and product development.

"I have already instructed DRDO and our other organisations to tie up with academic institutions in tapping the potential for innovation there and use it for not just academic research but also for defence production, based on merit," Parrikar said.

The defence minister, an IIT-Bombay alumnus, was speaking at the opening ceremony of the three-day technical festival 'Cognizance 2016' of IIT Roorkee.

"Some IITs, some NITs, IISc, some regional engineering colleges and other top academic institutions, we have planned to tie up with to work out R&D not just for innovation but production in the defence sector too.

"And, I think in six [to] twelve months we should be in a position to start the programme," he said.

Addressing a gathering of students, academicians and guests at the Convocation Hall, Parrikar said the government is determined to fulfilling the 'Make in India' vision and asked students to contribute to the country's growth story.

"I don't claim that all intelligence lie at IITs, but a substantial amount of it does. I mean look at this Convocation Hall, it was a hangar used during the Second World War or something and you have turned in into this big facility, therein lies your innovation," he said, as he received a loud applause.

He also proposed academic participation in defence offsets to create new projects that also bring in revenue.

"I think we should also use defence offsets to create such type of research projects in defence with academic participation," Parrikar said.

The minister cited example of some of the projects taking place in a few institutions like IIT-Bombay with Jet Propulsion Laboratory of the US.

Recalling his college days, Parrikar said the campus environment promotes innovation and entrepreneurship and students should make the most out of it.

"After finishing college, we started our own venture and later decided to enter politics. But, innovation is something the campus environment promotes and if you have great ideas then this programme fits in right there," he said.

Overhauling procurement policy

On the government's side, Parrikar said things are taking time to change since it's difficult to "shake off" decades of "inertia".

"Our new defence procurement policy not only aims to incentivise and promote indigenous production but also cut the red tape and remove bureaucratic hurdles, which have delayed plans in the past," he said. "What this vision gives to stakeholders is an ecosystem for innovation and development... The new DPP will of course expedite business and make defence a modern sector. The modalities have all been worked out and the final clearance to the draft should be given by March 21 and by month end it will be notified," Parrikar said.

Speaking at the 'Make in India Week' programme in Mumbai last month, the defence minister had said the new policy would come into effect from 2 April 2016.

"The DPP will have a new category of indigenously designed, developed and manufactured (IDMM) as the most preferred category for procurements, which aims to boost domestic private and small-scale industry," he had said, adding, the NDA government seeks to make the defence market "more lucrative" for the Indian industry.

Parrikar, an IIT-Bombay alumnus, exhorted the crowd of aspiring engineers at the sprawling IIT-Roorkee campus to value "knowledge over degree" and think out of the box. "Your director mentioned the three legs on which an idea or an institution stands – theory, practical and innovation. But there is the fourth leg and that is the ecosystem to allow that innovation and development and we seek to provide that kind of ecosystem," he said.

IIT-Roorkee wants to create 100 entrepreneurs by 2017

To mentor in guiding students from "ideation to execution"

Roorkee: IIT-Roorkee is giving the innovation hub in its campus a new push and has targeted to produce at least 100 entrepreneurs by next year besides shaping up an ecosystem where its alumni network world over would play the role of a mentor in guiding students from "ideation to execution".

As part of this new vision, the sprawling campus on Friday got a 'Tinkering Lab' which was inaugurated by Defence Minister Manohar Parrikar on the opening day of the college's technology festival 'Cognizance 2016'. Parrikar also inspected some of the models on display.

"The Tinkering Lab as the name suggests is a place where students can literally tinker around with ideas, without any fixed agenda or set up, and thus allow their imagination to run riot.

"And, once they have arrived at some shape as to the final output, that can be taken further or incubated," Director, IIT-Roorkee, Pradipta Banerji said.

Fourth leg

In the opening remarks at the festival which concluded today, Banerji said any idea or vision--stands on three legs--theory, practice and innovation --and Parrikar had later added that the "fourth leg" was the ecosystem for innovation, which the government was committed to provide.

The Defence Ministry has already set the ball rolling for DRDO and other organisations under it to collaborate with some of the IITs, NITs, IISc and other top institutions to tap innovation from academic campuses for design and production, Parrikar said.

In his address to a massive gathering of students at the Convocation Hall, which once served as a hangar, Parrikar emphasised the need to think "out of the box".

"As students you must contribute to the India's growth story and come up with innovative ideas.

"This hall was a hangar during the Second World War and now it's a wonderful Convocation Hall, so you see the spirit of innovation is already here," he said.

Banerji, elaborating the vision in this domain, said labs like the new one, besides the existing incubation centres will "further fuel" the entrepreneurial spirit of the students, and "by next year we expect to produce at least 100 innovators".

"We have also begun the process to harness our alumni strength which spans from Bombay to Bay Area, and create an ecosystem where they play the role of mentors to these young minds, sharing their own success mantras thus serving as role models and also in guiding them," he said.

IIT-Roorkee's parent institution, over 160-year-old Thomason College of Civil Engineering, the pioneering engineering institution in the country was created to train engineers for the construction of the Ganga Canal, considered an engineering marvel to this day. It was converted into a university soon after independence and in 2001 given the status of an IIT.

"The college has its own legacy and stories to tell and inspire students and with new tinkering lab will add a further push to our goals for continuous innovation.

"The new lab is spread in 12,000 sq ft and has two floors, housing two auditoriums where students can also hold seminars to discuss new ideas," Banerji said.

Def Expo's success in Goa likely to determine Aero India's fate

New Delhi: The Defence Ministry may take a call on making Goa the permanent venue for Aero-India after reviewing the conduct of DefExpo 2016, which is being held in the coastal state for the first time in the last week of March.

Almost four years ago, a Defence Ministry panel recommended shifting the biennial air show from Bangalore, due to flight safety issues - a move opposed by the Karnataka government - presumably because of the revenue loss to the state.

The proposal was first placed before Arun Jaitley during his short tenure as the Defence Minister, but it is now before his successor Manohar Parrikar, who hails from Goa.

The Def Expo 2016, to be kick-started in Quitol in Quepem taluka in south Goa on March 28, is a test case to determine whether the state would be able to cope up with the infrastructure needs required for organising such big defence shows where several types of aircraft including fighter jets will fly. The reasons for shifting the show from Bangalore include short runway (7200 ft), close proximity to the highway, adverse impact on the training schedule of the Indian Air Force and operational problems faced by the Bangalore International Airport.

In the absence of a "safe flying environment", participation of fighter jets in Aero India was going down over the years, while other air shows in Asia are becoming popular, sources said. Goa was selected as the best alternate site after surveying locations in Puducherry, Kochi, Chennai and Udaipur, but the decision is stalled due to political pressure.

The permanent infrastructure for Aero-India including a 10,000 ft runway would come up only after a government approval, sources said.

Goa's Industries, Trade and Commerce Minister Mahadev Naik said out of 220 acre land that the government holds in that area, 150 acres were given to the Defence Ministry to organise the prestigious show, using temporary infrastructure.

Big boost: Army to get ammo worth Rs 15k Cr.

Missiles and Rockets on Shopping List

The 1.18-million strong Army , grappling with critical operational deficiencies on several fronts, is finally going to get some much-needed missiles, thermal imagers, weapon-locating radars and multiple-launch rocket systems (MLRS).

Defence ministry sources on Friday said the Cabinet Committee on Security (CCS) has cleared four longpending arms deals worth Rs 6,600 crore, while two others for over Rs 8,300 crore are on the verge of getting the final nod. “Contracts for the four cleared deals will now be inked,” said a source. They will include the Rs 1,200 crore acquisition of 65,000 new-generation 84mm rockets, with greater range and better armour-penetration capabilities, for the Swedish-origin Carl Gustaf man-portable rocket launchers.

The other contracts are for 4,000 hand-held thermal imagers with laser-range finders (Rs 1,400 crore), 5,000 Milan-2T anti-tank guided missiles (Rs 2,000 crore) and 30 indigenous `Swati' weapon-locating radars (Rs 2,000 crore).

The two projects headed for CCS nod are for two more Pinaka MLRS regiments for Rs 3,300 crore and another regiment of BrahMos supersonic cruise missiles for over Rs 5,000 crore.

The two Pinaka regiments, which will add to the two such regiments already inducted by the Army , will help plug gaps in the force's medium-range, high-volume firepower. With a strike range of 40-km, the Pinaka is manufactured by the Tatas and L&T based on technology developed by DRDO.

Similarly , the BrahMos land-attack missile, which flies almost three times the speed of sound at Mach 2.8 to targets 290 km away , will help boost the Army's precision-strike capabilities.

With the Army already having three BrahMos regiments, the government has approved deployment of the missile's Block-III version in Arunachal Pradesh to counter China's huge build-up of military infrastructure all along the 4,057km Line of Actual Control. This missile variant has “trajectory maneuver and steep dive capabilities“ for mountain warfare, as reported by TOI earlier.

But the lack of third-generation anti-tank guided missiles (ATGMs), with fire-and-forget capabilities, remains a big operational gap on the western front with Pakistan. The case for inducting these shoulder-fired tank-killers has been meandering for almost a decade now.

The acquisition of `Spike' ATGMs from Israel, however, is still stuck in the commercial negotiations stage. Consequently , infantry battalions are making do with the second-generation Milan (2-km range) and Konkurs (4-km) ATGMs, which are produced by defence PSU Bharat Dynamics under licence from French and Russian companies. Being wire-guided, they have to be directed to the target.

POOR AMMUNITION RESERVES

1 **1.18-million** strong Army authorised to hold war wastage reserves (WWR) for **40 days** of 'intense fighting' since ammo stocks critical in winning battles

2 But existing WWR barely enough for **20 days** of intense fighting

3 Reserves '**critical**' (less than 10 days) in many types of ammo

Defence ministry in July 2013 approved Ammunition Road Map

Phase-I | Achieve **50% WWR** (20-day intense fighting & 3 years of training ammo) by **March 2015**

Phase-II | **100% WWR** (40-day intense fighting & 5 years of training ammo) by **March 2019**

➤ Overall cost around **₹97,000 crore**

➤ 23 types of ammo to be imported, rest to be manufactured by Ordnance Factory Board



STATUS

➤ Ammo stocks have improved in some areas like 130mm and 155mm high explosive artillery shells

➤ But major deficiencies persist in several areas like air defence, tank ammo, anti-tank guided missiles etc

Impossible to **achieve 100% WWR** by 2019

Cabinet Committee on Security (CCS) has cleared four long-pending arms deals worth Rs 6,600 crore, while two others for over Rs 8,300 crore are on the verge of getting the final nod

Navy bids farewell to spectacular Sea Harrier jump jets after 33 yrs

They were always a sight to behold, a force to reckon with. Fighters landing vertically, akin to helicopters, with ear-splitting roars on a moving airfield despite being fixed-wing. It left even the usually phlegmatic Manmohan Singh slightly nonplussed during the “PM's day at sea“ in 2006. Similar was the case of other politicians, before and after him, like A B Vajpayee and L K Advani.

But the old must give way to the new. Ahead of the 56-year-old aircraft carrier INS Viraat's retirement later this year, the Navy has bid adieu to its eyeball-grabbing Sea Harrier “jump jets“ after 33 years of yeomen service.

The force, after all, now has its first supersonic fighters in 30 MiG-29Ks -out of the 45 contracted from Russia for over \$2 billion -for INS Vikramaditya and the under-construction indigenous carrier INS Vikrant.

Navy inducted 30 of the British-origin Sea Harriers from 1983 onwards, but only 11 “air frames“ are left now due to old age, lack of spares and cannibalisation as well as accidents over the years. “They have flown their last. The six Sea Harriers on board INS Viraat, which has returned to Mumbai from her final operational journey to the International Fleet Review last month, disembarked from the carrier on March 6,” said an officer.

The 11 Sea Harriers are now been mothballed at naval air station INS Hansa in Goa before being distributed as museum pieces to different establishments. “Their pilots are going for career advancement courses or MiG-29K conversion training,” he said.

Interestingly, Sea Harriers were part of INAS 300 (Indian naval air squadron 300) nicknamed the ‘White Tigers’. And much like the feline genetic oddity, a Sea Harrier stood apart, capable as it was of VTOL (vertical takeoff and landing) operations.

“Harriers were certainly unconventional in their vertical landing, even though they usually took-off from the angled ski-jump on INS Viraat. With time, their production was stopped in the UK. The British Royal Navy also retired its Sea Harriers in 2006,” said another officer.

The White Tigers squadron will now hibernate till it's re-commissioned with MiG-29Ks for INS Vikrant, which is slated to be ready by 2018-19. Incidentally, INS Vikramaditya's MiG-29K squadron INAS 303 is christened ‘Black Panthers’.

Though the Sea Harriers had an operational speed of 640 knots or 1,186 kmph, with a range of around 800 nautical miles, they fell short of exceeding the speed of sound at Mach 1 or 1,235 kmph. They did undergo a “limited upgrade“ some years ago, including being fitted with Israeli Elta ELM-2032 multimode fire control radars and ‘Derby’ beyond visual range air-to-air missiles, but have outlived their utility. “MiG-29Ks give us a four-fold capability jump over Sea Harriers,” an officer said.

Never anticipated joining politics, says Parrikar

Roorkee: An IIT oalumnus, Defence Minister Manohar Parrikar says a public life was something he never anticipated and he was pushed into the river of politics from behind but managed to "swim successfully".

He used disarming sense of humour in his address to future technocrats while inaugurating IIT Roorkee's 'Cognizance 2016' on Friday, often having the students in splits.

"When I came here, I was given this two-page prepared speech but then I thought since we are talking of 'Make in India', so I would have my own speech. So, guess I'll go my way, the IIT way, and talk directly the students," he said, to a loud cheer, as he spoke extempore. "It's almost like coming back to IIT-Bombay. I spent my B.Tech days at IIT and later also took up a PG course but never finished the M.Tech. But more than degree and I valued knowledge. I spent 6.5 years at IIT, I didn't spend 6.5 years for undergraduation, but I have a B.Tech degree, as my affidavit says, and not M.Tech, Someone, may file a case (against me)," he said, leaving the crowd in raptures.

The minister was apparently making a reference to the row related to Union HRD Minister Smriti Irani's educational qualifications. On being a reluctant politician, he said, "Many IITians went to the US, the UK but I stuck here. Let me tell you I never anticipated joining politics. I was the one sitting by the side of the river and someone pushed me from behind into it." "But, I swam successfully, in that river and became chief minister of Goa and then the defence minister," he said, adding, "I was the general secretary of the mess and quite popular and thus got elected for three years.

At least that proves that doing the mess management I learned to steer the state finances properly."

Moving on to examinations, he said the current generation is "luckier" as far as engineering examinations are concerned.

"Let me tell you, open book examination is the most difficult one.

As you have to know where the answer lies, going through the book twice, thrice" as he asked students to inculcate, out-of-box thinking and contribute to the growth story of India.

Paris acknowledges India may not purchase Rafale

Build F-16 in India and supply it to Pakistan, taunts a French official

Paris is beginning to acknowledge the possibility that India might not buy the Rafale fighter because of sharp differences over the price, and New Delhi's insistence on enforceable guarantees regarding the fighter's delivery, performance and availability.

A senior French official with a close view of the on-going negotiations between New Delhi and Paris for 36 Rafale fighters told Business Standard on condition of anonymity: "If some people in the MoD (the ministry of defence) do not want to allow the Rafale deal to go through, so be it. We are currently building it for Egypt and Qatar, and we could have another customer in Malaysia."

Underlining the irritation at repeated US offers to set up an assembly line in India to build the American F-16 Super Viper, the French official taunted: "If you don't want the Rafale, go ahead and build the F-16 here. You can build it in India and supply it to Pakistan also."

He was referring to Washington's announcement last month of the sale to Pakistan of eight advanced Block 50/52 F-16 fighters for \$699 million. Simultaneously, a senior Lockheed Martin official had publicly offered to "move our [F-16] production line from the US to India".

Reminded that France, too, was supplying submarines to both India and Pakistan (DCNS is building six Scorpene submarines with Mazagon Dock, after earlier selling Pakistan three advanced Agosta-90B submarines with air independent propulsion), he retorted, "That is different. Pakistan is getting a different submarine from what we are providing to India."

The official dismissed the notion that an Indian order was critical for Dassault to break-even in the Rafale project, in which tens of billion euros have been spent on developing the fighter and establishing a production line. The official claimed, "The Rafale project is commercially viable based on the numbers that the French military requires, even if there is not a single export order."

In fact, defence budget cuts have forced the French military to slash Rafale orders from over 300 originally planned to only 180 ordered so far. That is a small order, given that the Eurofighter Typhoon has over 700 aircraft on order; while more than 4,500 F-16s have been built over the years.

On New Delhi's demands for sovereign guarantees from the French government, or a bank guarantee from Dassault, to cover the possibility of delivery or performance shortfalls in the Rafale, the official declared the two countries would soon sign an inter-governmental agreement (IGA), which would function as a sovereign guarantee.

"The government of France is standing behind the sale. Surely, India is not asking for a bank guarantee when it has the word of the French government?" asked the official.

When it was pointed out that the IGA would only outline a supply agreement in broad terms, without detailed binding clauses and penalties, the official responded that the IGA was a strategic agreement between Paris and New Delhi, and that "a phrase here or a sentence there would make no difference."

In 1917, when the United States abandoned its isolationism and sent a division of troops to France to fight in World War I, it was not because there was some document with a clause that required them to fight. It was because of a common strategic aim. New Delhi and Paris must have a common strategic aim on the Rafale."

French officials argue that if Dassault is required to provide a bank guarantee against possible shortfalls in delivery and performance, India should cover that cost, which is normally three-four per cent of the guarantee amount.

Meanwhile, the Cost Negotiation Committee on the Rafale has made little headway in bridging the gap between the French demand and Indian counter-offer, which are believed to be around euro 12 billion and euro 9 billion, respectively. Issues of liability are further complicating the likelihood of a deal soon.

Prime Minister Narendra Modi, while visiting Paris last April, had requested for 36 Rafales, after a breakdown in negotiations for a much larger order for 126 Rafales. The Indian Air Force had chosen the Rafale on January 31, 2012, after an exhaustive evaluation of six fighter aircraft.

