

UTTAM AESA will be ready for induction on Tejas Mk 1A : Dr G. Satheesh Reddy

Let's begin with the big news of the year, the anti-satellite test (A-Sat), which the DRDO successfully carried out in March 2019. How would you sum it up?

It was a major technological achievement for the nation. Necessary technologies were already developed as a part of our missile development programmes and ballistic missile defence programmes; but it was required to be customised and integrated together to achieve the desired outcome. Though the building blocks were put in place some time back, the activities of the mission for demonstration of the technological capability were initiated only after the clearance by Prime Minister in late 2016.

Confidentiality was a major challenge for development of a programme of this magnitude, involving multiple laboratories and agencies, with technical complexities. It was also required to conduct the tests at the earliest. A lot of planning was involved from conceptualisation of the mission through development to interception demonstration within two years, ensuring that it is kept confidential. The short time taken by DRDO to migrate from concept to capability demonstration indicates the maturity of technologies, dedication, willingness and capability of DRDO fraternity to accept technological challenges for its time-bound realisation.

We were able to hit the satellite directly with the precision of a few centimetres. The altitude was deliberately kept low, about 250-300km, to avoid the long-term effects of the hit, like the scattering of the debris in the higher orbit. In terms of capability, we can reach beyond 1,000km. Since most of the satellites are in low earth orbit, this capability is adequate as of now. Of course, there are some satellites at medium altitude too, but once we have demonstrated this capability, we can always enhance it by increasing the propulsive power in the vehicle.

Are you working on enhancing that?

No, we are not planning to enhance it as all the technology requirements for the requisite capability have already been established. Having achieved the desired objectives, this programme has been successfully concluded.

It is also important to note that such tests cannot be done repeatedly.

The government established a task force on Artificial Intelligence (AI) last year as part of its initiative Innovations for Defence Excellence (iDEX) that was launched during DefExpo 2018. Since then both Bharat Electronics Ltd and Hindustan Aeronautics Ltd have announced their programmes pertaining to AI, robotics and swarm technologies. What is DRDO's role in this? Is it a mere coordinator or is it guiding the research?

iDEX is a nice initiative by department of defence production (DDP). DRDO, being the only agency involved with design and development of defence systems, is pursuing a lot of research in this area. DRDO has been encouraging and providing technological and other support to academic institutions, like IITs and industries, both public and private sectors, through various platforms and will continue to support them.

Are you also looking at some kind of collaboration with friendly foreign nations who are doing advanced research in this area?

We have been working with several countries including the United States, Russia, United Kingdom, France and Israel through joint working groups on technology. We have identified several futuristic

technologies for joint research in areas like nano technologies, nano sensors, deep learning etc. However, we are still to have any specific collaboration or agreement.

We are conscious of the fact that technologies of the future need to be developed within the country to avoid perpetual dependence on other countries. DRDO has set up Young Scientist Labs for concerted research efforts in these advanced technology domains. In addition to continued efforts at our own labs, we are supporting start-ups in a big way. The role and importance of our academic institutes cannot be understated in providing 'blue skies research' for such crucial technologies.

Do you have a separate corpus for this?

The fund allocated to us is for all technology domains and as such we do not need to create a separate corpus for this.

Do you find enough interest among the services for AI-enabled weapons?

Yes, the services have been showing a lot of interest in AI-based weapon technologies. In fact, a number of systems are being developed based on their requirements.

Given that AI is such a vast field and the services would want everything, from basic technologies for command and control as well as advanced weapons. Where are you putting the focus?

We are concentrating on both — basic technologies as well as advanced applications. Control on technologies is crucial. Our labs are working on many products with AI-based technologies. We have also set-up a Young Scientist Lab in this critical technology domain. In addition, we are encouraging start-ups to come up with technologies, systems and products with AI. At the same time, we are working in tandem with academic institutions also on basic technologies.

Do you envisage some joint development projects with friendly countries in the future?

Yes, we may have joint development projects with friendly countries for technologies and systems of mutual interest. Joint working groups have been already established for this.

What kind of work are we doing in the field of hypersonic missiles?

We have recently conducted a hypersonic technology demonstrator test. It was a successful launch and we got a lot of data, which will be very useful for our future tests. We are currently working on hypersonic engines and hypersonic materials. We have undertaken projects for enhancing our capabilities in the areas of aerodynamics, aero-thermal effects, material sciences etc. for use in hypersonic missiles.

What timeline do you envisage for the development of the prototype of a hypersonic missile?

Developmental activities in this area are being undertaken by the different labs. I anticipate that a flight demonstration of hypersonic missile should be ready after five years.

What is the update on Nirbhay cruise missile? What percentage of the missile is indigenous?

Nirbhay is a very successful programme. We have successfully developed and flight-tested the long-range subsonic cruise missile. Six tests have been conducted to validate all the mission objectives and requirements as of today.

I would say close to 70 per cent of the missile is indigenous. We didn't take any help from anyone in the design and development of this missile, except for buying certain off-the-shelf components from abroad. Imported engine was utilised in the initial tests; however indigenous engine has been developed in parallel, which would be used in the production version of the missile. Major technologies like actuators, Inertial Navigation Satellite System, etc. used in the missile system have been developed indigenously.

Can Nirbhay be inducted into service?

Yes, it can be. The developmental trials are completed for the present land-based configuration of the missile system and the capability has been established. We are discussing its operationalisation with the Services for other variants like sea-based and air-launched versions.

Are you looking at the possibility of making this missile intelligent?

Improvement in developed product or system capabilities is a continuous process for an R&D organisation and we are no exception.

What is the update on Prahaar ballistic missile?

Prahaar is a surface to surface missile. The mobile launch platform will carry multiple missiles, which can have different kind of warheads meant for different targets and can be fired in salvo mode in all directions covering the entire azimuth plane. Development trials of Prahaar have already been conducted.

While DRDO has a full range of unmanned aerial systems, there doesn't seem to be any programme to develop unmanned combat aerial vehicles (UCAV). What is the reason for this?

In the unarmed UAV category, we have the Rustom family. Rustom 1 is fully developed. Its trials have been concluded. Rustom 2, a medium altitude long endurance (MALE) UAV, is in the advanced stage of development. As far as UCAV is concerned, we don't have any sanctioned programme as on date; however, we have undertaken development of technologies required for realisation of UCAV.

The armed forces are inclined to procure more and more precision guided munitions. We already have Harpy and now we are going to procure Harop too. What is DRDO doing in the realm of smart, precision weapons?

The purchase of Harpy and Harop is based on the present requirements of the services. A lot of work is going on in DRDO, along with academia and industry in this area. Two premier laboratories of DRDO are working in the area of precision weapons.

What kind of work are you doing in anti-radiation systems and anti-airfield weapons?

Both the systems are quite distinct from one another. Anti-radiation systems are for a very specific purpose and the necessary intelligence to target radiating systems is built into the system. We have a number of on-going projects for the development of anti-radiation systems. Anti-airfield weapons system has already been developed and is undergoing trials; development trials are likely to be completed by the end of this year. We shall continue to work on this system to further refine the technologies involved. All of this is designed and developed entirely indigenously.

What is the status of the ballistic missile defence programme?

We have developed and demonstrated ballistic missile defence systems, both with exo-atmosphere and endo-atmosphere interceptors. With exo-interceptor, we have achieved the altitude range of up to 120-140km, through both real and simulated tests. We have adequate radars and sensors to meet the present requirements. The development of Phase-I of the programme, meant for up to intermediate range missiles, is complete.

But why is it not deployed yet?

Our mandate is to design, develop and demonstrate the capability of the systems. We support the lead system integrators or the production agencies for production of the quantity required. When, where and how to deploy a system is a government decision. We are ready to implement the decision as and when taken.

So, what have been accomplished in phase-I?

As I've already mentioned, both exo and endo interceptor capabilities have been successfully demonstrated. I would like to add here that India is one of the few countries in the world to successfully pursue the BMD programme. We have taken significant strides in this domain. We have also demonstrated kinetic kill and all the necessary technologies needed for this have been developed indigenously.

Since the airspace division is roughly about 100 km, if you are able to do your endo-atmosphere interception at a very high altitude (which according to reports was only 45 km), then you can perhaps kill hostile hypersonic missiles too which travel at this altitude?

The hypersonic BMD is a different technology domain. The way one develops the ballistic missile defence is different from what is needed for hypersonic missile defence. The hypersonic missile can be intercepted at different altitudes. A limited capability is being built in AD-1 interceptor to engage hypersonic glide vehicles.

Is it correct to say that for the endo-interception we are looking at an altitude of about 45 km?

We have the capability to engage a target at different altitudes.

Has work commenced on phase-2?

Yes, we have already started work on Phase-2 and it should be ready for demonstration in about two to three years' time.

DRDO has been looking to collaborate with a technology partner for a jet engine and was in talks with Safran Aircraft Engine. What is the update on that? Will you continue to work on the Kaveri engine or develop a new one?

The Kaveri engine, as a technology, is developed. The power of the engine, within the present constraints, is not sufficient for the current requirements of Light Combat Aircraft (LCA). We have a roadmap for aircraft development in the country, which also requires development of high-power engines suitable for these aircrafts. For this, we are looking for partners who can join hands with us in the development of high-power jet engine. I will not name any particular company right now because we are still at a discussion stage.

What is the update on the Air Independent Propulsion (AIP) system? Are you looking for some hand-holding in this programme?

We are developing the AIP system completely indigenously. We have the capability to do this on our own and we are confident that we will be able to do this successfully on our own. We don't need any hand-holding for this.

When will you be ready to show it to the navy?

I am confident that we will be able to demonstrate it to the navy by the end of this year.

What is the update on your Next-Gen anti-tank missile system?

We have developed a number of variants of anti-tank missiles as per the requirements of the services. User trials of Nag ATGM have been successfully conducted and development trials of Helina, the airborne anti-tank missile, are under progress. We are currently working on MPATGM (man-portable anti-tank guided missile) programme. Five demonstration trials have already been completed and we would be able to offer it for user trials soon. We have now demonstrated the capability to indigenously develop best of its class ATGMs, which can be produced by Indian industry.

What is the progress on Tejas II?

Tejas II is progressing well. The design phase has been completed. As far as the engine is concerned, the user is satisfied with the present one used and so we will go with the same. For the Indian Navy, we are working on a separate programme as the requirements are different. The design phase for Mark II Navy is over and it will certainly meet all their requirements.

Will there be substantial difference between Tejas II and Naval Mark II?

These are different aircrafts based on the different requirements of the users.

In the early Nineties, Dr APJ Abdul Kalam had mentioned that the DRDO was working on a milli metric wave (MMW) seeker for the Nag ATGM. Since the Nag programme is over now, are you still working on MMW seeker?

We have been working on the MMW-based seeker very seriously. Today, the seeker is developed and we are working on an anti-tank missile with MMW seeker. This is a separate programme, approved by the government. We have been working on it for the last couple of years. The prototype will be ready by the end of this year.

What is the project called?

Let us wait for the first demonstration trial.

As DRDO chief, what are your priorities, in the short and the medium term?

I have advised my lab directors to focus on three categories based on timelines. The first category is futuristic research. Being an R&D organisation, we need to work on futuristic research, which is applied research supported by basic research by the academia. This is essential for any country to progress. The second category is of current technologies, which we need to work upon for the next five years, for development of weapons, systems and platforms. The third category comprises on-going programmes.

Based on this, we have drawn a very explicit roadmap for all our laboratories. This lays down targets for the next two years, two to five years and five to 10 years respectively. All the laboratories are working to meet the targets within the given time frame.

Will nano technology be part of your AI system?

Nano technology is a natural evolution and would increasingly be a part of, what we refer to as, hardware for any system. AI-based systems also would not be an exception.

You have mentioned IIT-Delhi. Which other educational institutions are you working with?

We have centres of excellence at IIT-Chennai, IIT-Mumbai, Jadavpur University, Bharathiar University of Coimbatore and Indian Institute of Science, Bangalore. In addition to these, we are working with 150 other academic institutions. Depending upon their core strength and our requirements, we fund developmental research in the areas of high energy materials, propulsion technology etc. in these institutes.

How many prototypes have you made based on the research done in the academia?

We have a very fruitful association with the academia for several decades now. A number of prototypes have been made based on the research that emanates from these institutes.

One of the factors that have stymied the development of Indian defence industry is the inability to export. What steps have been taken to not only encourage, but promote exports?

The government has come out with several policies to promote exports. We are creating awareness of DRDO developed products and systems by showcasing them in international defence and aero shows. Keen interests have been shown by many countries for different systems. We will be supporting the industry with technologies to enhance their export competitiveness.

What is DRDO doing in the sphere of cyber warfare?

Space and cyber has become the fourth and fifth dimension of warfare. DRDO has been working in the domain of cyber defence closely with all stakeholders to ensure safety and security of our defence systems and equipment.

What is the update on AESA radar?

The AESA radar is integrated with the Light Combat Aircraft. The test and evaluation are going on at the moment. We are confident that AESA radar would be fully proven by the next year and would be ready for induction on Tejas Mk 1A.

Is there anything else that you would like to speak about?

On the technology front, we are very seriously working on AMCA (Advanced Medium Combat Aircraft). The design efforts have started, product development has begun and we are regularly interacting with the Indian Air Force (IAF) on this.

We are now integrating with the Indian industry in a big way. We would be engaging the industry as the development-cum-production partner from the beginning of the project to ensure seamless transfer of technology and offer systems from first of production model for trials to cut down the development cycle time. Para 72 of DPP 2016 facilitates this. We want to strengthen our

manufacturing base by enabling Indian industry through their involvement as partners and not limited to assembly line job.

<http://www.defencenews.in/article/UTTAM-AESA-will-be-ready-for-induction-on-Tejas-Mk-1A--Dr-G-Satheesh-Reddy-586357>



Fri, 09 Aug 2019

Defence Minister clears acquisition of two BrahMos supersonic cruise missile coastal batteries for Navy

In a major boost for the naval forces, the Defence Ministry on Thursday cleared the acquisition of two BrahMos supersonic cruise missile coastal batteries for the Indian Navy. The Defence Minister also cleared the acquisition of 'Made in India' software-defined radios for the armed forces.

The decision to this effect was taken during the meeting of Defence Acquisition Council (DAC), which was Rajnath Singh's first meeting ever since he took over as the Defence Minister.

The highly placed government sources had said on Wednesday that during the DAC meeting, the Defence Minister is expected to decide on acquisition of weapon systems worth around Rs 12,000 crore including the procurement of two BrahMos supersonic cruise missile batteries for the Navy.

"The two mobile missile coastal batteries have to be acquired for the Navy. The Navy would deploy the Rs 1400 crore BrahMos supersonic cruise missile batteries deployed on the Tatra trucks close to major cities from where it can destroy any incoming enemy warship in case it is posing any threat," government sources said.

The Navy wants to use the two BrahMos missile batteries to replace its existing systems which have become old and need replacement, they said.

In the DAC meeting, Singh is also expected to take a call on the acquisition of 14 medium-lift choppers for the Indian Coast Guard which are likely to cost more than Rs 7,000 crore.

During the meeting, Singh will also take a call on the deviations in the proposal for acquisition and manufacturing of AK-203 assault rifles between India and Russia, the sources said.

The Defence Minister will also decide on the proposed procurement of two electronic warfare systems for deployment along the Pakistan and China borders.

Though the DAC is meeting for the first time since the new government was formed, the Narendra Modi administration has already spent around Rs 8500 crore for meeting the emergency requirement of the forces in its first 50 days.

Weapon systems such as the Spice 2000 stand off bombs and Spike anti-tank guided missiles from Israel, Strum Ataka air-launched ATGM and several other spare parts from Russia have been acquired under these powers by the Indian Air Force.

<http://www.defencenews.in/article/Defence-Minister-clears-acquisition-of-two-BrahMos-supersonic-cruise-missile-coastal-batteries-for-Navy-586354>

India banks on key pacts to avoid US curbs

Hopes Washington will respect its age-old relations with Russia to keep defence ties growing

By Ajay Banerjee

New Delhi: With the United States threatening to impose sanctions on countries that deal with Russia for military equipment, the government is hoping that US Department of Defence will hold sway and prevent sanctions against India.

The India-US Defence Policy Group (DPG) met in the US last week where several issues were discussed. The DPG is the apex official-level meeting mechanism between the Ministry of Defence of India and the US Department of Defence.

In October last year, India sealed a deal to procure the S-400 "Triumph" air-defence missile system from Russia at some \$5.4 billion. It is an advanced air and missile defence system intended to engage targets at ranges of up to 400 km in an intensive jamming environment.



Sources said the hope is on the US Department of Defence, which is closely cooperating with India on several new military pacts and agreements, will hold sway. India and the United States have in the past 12 years inked agreements worth \$18 billion that includes cutting-edge technology. India, in the past few years, has separately inked with the US two other military agreements called the Communications Compatibility and Security Agreement (COMCASA), and Logistics Exchange Memorandum of Agreement (LEMOA). The LEMOA allows India to use US facilities for re-fuelling.

To have further more such weapons and arms to be sold and for continuation of agreements, imposing sanctions will not help the United States. Already military equipment making giants Lockheed Martin and Boeing have tie-ups to procure from India and the militaries of the two countries are coordinating of several issues.

The previous US Secretary of Defence, James Mattis, had been in favour to get waiver for India to keep the defence ties on track. The new US Defence Secretary Mark Esper, who took over last month, is yet to publically reveal his mind.

The United States, in June last year, passed the Countering America's Adversaries through Sanctions Act (CAATSA) that requires imposing curbs on nations that have "significant" defence relations with Russia. There is a provision for a waiver and New Delhi has argued out its case to the Washington. The waiver authority is not a blanket waiver. Waivers are considered on transaction basis.

India has argued that its ties with Russia stand separate from ties with United States. India and the US are now discussing the Basic Exchange and Cooperation Agreement (BECA). It enables use of US-produced geospatial maps which will sharpen the accuracy of missiles.

BrahMos to be deployed along coast

- India will deploy BrahMos cruise missiles along the coast, acquiring the ability to target hostile or enemy ships at sea that are some 300 km away
- The decision was taken at a Defence Acquisition Council's meeting headed by Defence Minister Rajnath Singh on Thursday. This was the first DAC meeting chaired by Singh since assuming office

- The Brahmos will be part of the next generation maritime mobile coastal batteries. The surface-to-surface version of the missiles would be deployed along the coast, the Ministry of Defence said <https://www.tribuneindia.com/news/nation/india-banks-on-key-pacts-to-avoid-us-curbs/815123.html>



Fri, 09 Aug 2019

Lockheed Martin willing to partner India on LCA Tejas Mk-II & AMCA

The world's largest defence contractor does not believe that the Indian Air Force (IAF) commitment to the indigenous Light Combat Aircraft (LCA) kills the market for foreign single-engine fighters in India. While pitching the F-21, Lockheed Martin is also offering technical assistance to increase the production rate of the LCA.

With its F-21 campaign pegged on a robust Make in India proposition, Lockheed Martin brought 26 Tier 1 suppliers for the F-16/F-21 to its Indian Suppliers Conference at New Delhi recently to dialogue with 70 shortlisted Indian companies in the run up to the Multi-Role Fighter Aircraft (MRFA) competition. Excerpts from the interview with Dr Vivek Lall, Vice-President Aeronautics Strategy and Business Development, Lockheed Martin:

Vishal Thapar (SP's Aviation): What sort of Transfer of Technology (ToT) and partnerships are you discussing at the Indian Suppliers Conference?

Dr Vivek Lall (VL): We've got 26 of our Tier 1 suppliers here as well as over 70 Indian companies here. This 3-day conference will have more than 540 meetings. The whole idea is to continue to build the aerospace eco-system here in India, so that once we're tasked to build a fighter, we have all the building blocks here, and the suppliers vetted, not just us but also our Tier 1s.

So, there's a ToT and the indigenous content bit. ToT is dependent upon ability to absorb technology. It's a range of ToT being looked at depending upon the component.

"The LCA is an Air Defence asset. The F-21 is Deep Penetration Strike Aircraft. And so, the operational profiles are different. The F-21 flies farther. It stays on station longer, and it gets there faster. So, it has a very different operational profile. The F-21 is very complementary to the Tejas. We've also extended our support, in any way possible, to the Government of India on the LCA"

At our 2 JVs at Hyderabad, we have delivered 108 C-130 empennages, over 150 Sikorsky S-92 cabins. The 5,000+precision components that go into the Sikorsky cabins have all been indigenised. That shows the progress made in indigenisation.

As we announced last year, all future wing production of the F-16s, regardless of the outcome of the competition, will be done jointly with the Tatas. The manufacture of the prototype wing has already started.

Once the EoI (Expression of Interest) is out (for the MRFA programme), we'll be able to better define what ToT is included in our offer. We'll be completely compliant with the Indian requirements and the intent is to create an indigenous fighter platform here in India just like we've done in other countries. We're proven to do that.

SP's Aviation: What attributes are you looking for in potential partners?

VL: Our Strategic Partner for the F-21 programme is Tata. We've had a great experience with 2 JVs with Tata in producing the C-130 empennage and the S-92 cabins over the last 10 years for the global

supply chain and as we've fleshed out that eco system, what we're looking for obviously is performance, capability, quality, cost schedule but above all, a vision of the roadmap of technology absorption as well as take not just the present project but what's the future and put this in the wrapper of integrity and shared common values.

"We have a system called the Auto GICAS, which is a collision avoidance system. It can be integrated on to the Indian platform. It's a unique system that saves lives. It's able to correct when the pilot is disoriented. The other technical expertise can be in terms of increasing production rates and capacities"

In any robust eco-system, the founding blocks are those of MSMEs and so it's very imp for them to come up the value chain in terms of their expertise. And as we go over 200 companies in India. we've found that expertise, pockets of excellence, in terms of being able to deliver. So we look at the same attributes across the supply chain. We've incubated a lot of start-up companies for the Tata programme.

With the F-21, we're offering participation in global production, and the global demand to be fulfilled from India through a long-term partnership. Lockheed Martin is the only company with operational 5th Generation platforms. So, all that learning, roadmaps are leveraged by all our platforms. We seek to bring these technologies into a robust Make in India programme.

We have a dedicated team performing Indian supplier onsite assessments. We have found over 200 companies in India. The Suppliers Conference is an opportunity for Tier 1s to have a dialogue with Indian industry.

"There are several unique aspects to the F-21. One is that it's the only aircraft in the world with dual re-fuelling – both the probe and drogue and the boom re-fueller. The second aspect is that it has an India unique EW suite. The third thing is that it has 40 per cent more weapon carrying capability through the triple rail launcher that we have on the F-21. Then, we've added an aft dorsal fin which gives increased growth capacity to it, and finally it's got a modern cockpit"

SP's Aviation: You seem fairly committed to the Tatas. But the Indian Strategic Partner for the F-21 programme has to be selected by the Government of India. Are you flexible in your choice of a partner for this competition?

VL: We have two very successful JVs with the Tatas over the last 10 years. All future wing production for the F-16s globally will also be done with the Tatas. For the F-21, we are strategic partners. But obviously, as the competition plays out, we will be following the Government of India guidelines and we will be compliant.

SP's Aviation: Under this Strategic Partner model, foreign OEMs are allowed to be part of multiple bids. Should Tata not make it, would you be willing to go with another group?

VL: That's a hypothetical question. But suffice it to say we've talked to over 200 companies in India and it (Tata)is our Strategic Partner along with an entire eco system. That's why we're doing these supplier conferences (together).

"To start with, the F-35 would be a government-to-government conversation. I can't really comment on that. But having said that, Lockheed Martin is the only company in the world which has two operational 5th Generation fighters. All these technologies are leveraged for the F-21 platform"

SP's Aviation: How would the entry of Public Sector Undertakings (PSUs) in a Strategic Partnership programme change the competition?

VL: These are hypothetical questions. We'll wait for the EoI and RFP to come out and comply with Government of India guidelines, but suffice it to say that we're interfacing with both private and public companies. In fact, recently, we've signed an MoU with BEML. That's a public company, and so, we're talking across the spectrum, and once the requirement becomes clear from the Government of India, we will comply with them.

Here (at the Suppliers Conference), we have both public and private companies present. I think to have a robust eco system, it's less about the ownership and more about the capability to perform and absorb technology, and those are some of the factors that go into a successful programme that could be public or private. Whatever drives competitiveness in Indian industry is good.

"We've got 26 of our Tier 1 suppliers here as well as over 70 Indian companies here. This 3-day conference will have more than 540 meetings. The whole idea is to continue to build the aerospace eco-system here in India, so that once we're tasked to build a fighter, we have all the building blocks here, and the suppliers vetted, not just us but also our Tier 1s

SP's Aviation: While this is indeed a hypothetical question, your competition, Boeing has already tied up with the public sector HAL, which is the only one which has existing manufacturing facilities. Doesn't that put you at a disadvantage?

VL: No, I think we have the best Make in India offer on the table. We have the most robust package. Not only that, if you look at the sustainment market, we have the world's largest fighter eco system: 3000+ fighters flying. So, when you look at the after sales support and the MRO market, the scale that we have to offer India to plug into this eco system is completely unmatched by any competitor.

SP's Aviation: The IAF has a big commitment to the indigenous LCA Tejas fighter. Will this kill the market for foreign single engine aircraft in India?

VL: The LCA is an Air Defence asset. The F-21 is Deep Penetration Strike Aircraft. And so, the operational profiles are different. The F-21 flies farther. It stays on station longer, and it gets there faster. So, it has a very different operational profile. The F-21 is very complementary to the Tejas. We've also extended our support, in any way possible, to the Government of India on the LCA.

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SP's Aviation: Does that mean there's potential for (international) cooperation on the LCA Mk-II?

VL: Absolutely. We're willing to work with the Government of India whether it's the LCA Mk2 or AMCA.

SP's Aviation: What's your offer?

VL: Depends upon their requirements. And we will work with the Government of India. Everything is caveated to US Government approval and what the Government of India desires a foreign OEM to assist with.

SP's Aviation: You are a seasoned observer of the Indian scene. What could be the possible areas of cooperation on the LCA or AMCA? What could be on offer?

VL: We have a system called the Auto GICAS, which is a collision avoidance system. It can be integrated on to the Indian platform. It's a unique system that saves lives. It's able to correct when the pilot is disoriented. The other technical expertise can be in terms of increasing production rates and capacities.

SP's Aviation: Lockheed Martin's earlier offer of the F-16 in the MMRCA programme was not found technically compliant. How is the F-21 offer different in capability terms?

VL: So, there are several unique aspects to the F-21. One is that it's the only aircraft in the world with dual re-fuelling – both the probe and drogue and the boom re-fueller. The second aspect is that it has an India unique EW suite. The third thing is that it has 40 per cent more weapon carrying capability through the triple rail launcher that we have on the F-21. Then, we've added an aft dorsal fin which gives increased growth capacity to it, and finally it's got a modern cockpit.

SP's Aviation: The capabilities of the competing fighters in the fray were extensively tested in the earlier MMRCA competition. Will it be the Make in India industrial offer which will be the deal clincher in this competition?

VL: As I just mentioned, the capability is quite different in the F-21 than what used to be there in Block 70. But indeed, having a very robust Make in India programme and a robust supply chain is very much part of this process. So, Make in India, Startup India, Skill India – all Government initiatives – are priorities, and this programme addresses them.

SP's Aviation: Will the F-21 lead in to the F-35?

VL: To start with, the F-35 would be a government-to-government conversation. I can't really comment on that. But having said that, Lockheed Martin is the only company in the world which has two operational 5th Generation fighters. All these technologies are leveraged for the F-21 platform.

<http://www.defencenews.in/article/Lockheed-Martin-Willing-To-Partner-India-On-LCA-Tejas-Mk-II-and-AMCA-586372>